APPENDIX I2B: PRELIMINARY HYDROLOGY STUDY SITE 2

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PRELIMINARY HYDROLOGY AND HYDRAULICS STUDY FOR THE BLOOMINTON COMMERCE CENTER

TENTATIVE PARCEL MAP 19973

COUNTY OF SAN BERNARDINO
CALIFORNIA

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JULY 29, 2020

This report has been prepared by or under the direction of the following registered civil engineer who attests to the technical information contained herein. The registered civil engineer has also judged the qualifications of any technical specialists providing engineering data upon which recommendations, conclusions, and decisions are based.



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I. PURPOSE AND SCOPE

The purpose of this study is to determine the necessary drainage and increased runoff mitigation improvements required for the Bloomington Commerce Center. The Bloomington Commerce Center is a proposed industrial building located on the north east corner of the Jurupa Avenue and Locust Avenue intersection in the unincorporated area of San Bernardino County.

The scope of the study includes the following:

1. Determination of points of flow concentration and watershed subareas for onsite and offsite areas.
2. Determination of the 100-year peak storm flows based upon the ultimate condition offsite and post-project onsite areas utilizing the Rational Method as outlined in the San Bernardino County Flood Control Hydrology Manual.
3. Determine the 100-year peak storm flows based upon the pre-project and post-project condition for the 24-hour storm duration utilizing the Unit Hydrograph Method as outlined in the San Bernardino County Flood Control Hydrology Manual.
4. Determine the preliminary required facilities to mitigate the 100-year peak storm flows for the 24-hour storm duration in the post-project condition to flows less than or equal to the existing condition flow rates. This is for the onsite area only.
5. Determine the required storm drain infrastructure to flood protect the project site for the 100-year storm event.
6. Preparation of a hydrology report, which consist of hydrological and analytical results and exhibits.

II. PROJECT SITE AND DRAINAGE AREA OVERVIEW

The Bloomington Commerce Center is a proposed industrial project that proposed to construct a distribution warehouse facility, parking lot area, landscaped area, storm drain infrastructure, offsite street improvements, and infiltration basins, infiltration trenches and a subsurface system. The project site is approximately 60 acres, and is roughly bounded by Locust Avenue to the west, Jurupa Avenue to the south, Maple Avenue to the east, and Santa Ana Avenue to the north. The project is located in the unincorporated area of San Bernardino County.

The existing site consists of a Palm Tree Farm and multiple single family residences that will be converted into a warehouse distribution center or similar industrial site warehouse. Even though the project site has various impervious surfaces existing within the project limits, the pre-project unit hydrograph analyses assumed 0% impervious to be conservative during the preliminary stages. The project site will collect onsite flows via a series of subsurface storm drains, grassed swales, and sheet flows within infiltration basins, infiltration trenches and a subsurface system. These flows will be treated for water quality purposes and mitigated for increased runoff. The water quality analyses has been included in the Water Quality Management Plan. The increased runoff analyses for the preliminary stages only analyzed the 100-year analyses, since this storm event produces the larges volumes. During final

engineering, detailed analyses for the outlet structures and smaller storm events will be performed.

The project site also intercepts a large amount of flows from the offsite area, however, the project site only addresses water quality and mitigation for the project site. The offsite analyses utilized the ultimate land use based upon the general plan, however, it is assumed that when the offsite area is developed, additional measures will be provided for the onsite areas that will reduce these flow rates, so intercepting the ultimate condition flow rates is a very conservative assumption. Additionally, the time of concentration for the offsite existing condition for the rural residential development that exists is much less than the onsite area, therefore, the onsite area will be treated and mitigated before the peak offsite flows reach the project.

All the onsite and offsite flows ultimately discharge into either the existing downstream basin or the natural flow path south of Jurupa Avenue. The offsite flows to the west of the project will be intercepted through a series of proposed inlets located along Locust Avenue that will discharge into the Line 1 System.

III. HYDROLOGY

The San Bernardino County Hydrology Manual (Reference 1), was used to develop the hydrological parameters for the hydrology analyses. The rational method and unit hydrograph method were used for the analyses and the computations were performed using the computer program developed by Civil Cadd/Civil Design.

The rainfall depths for used in the hydrology calculations for the rational method and the unit hydrograph method are as follows:

Storm Event & Duration	Rainfall (inches)
2-Year, 6-Hour	1.34
2-Year, 24-Hour	2.41
10-Year, 1-Hour	0.821
100-Year, 1-Hour	1.30
100-Year, 6-Hour	3.09
100-Year, 24-Hour	5.66

The rainfall depths were obtained from NOAA Atlas 14, which has been included as Exhibit E.

The existing soil classification for the offsite area consists of Hydrologic Soil Group "A" and "D", and the onsite area consists of Hydrologic Soil Group "A", as shown in Exhibit D. Exhibit D is a Soils Map obtained from the National Resource Conservation Service Websoil Survey. An Antecedent Moisture Condition of II was used for the 10-year and 100-year calculations.

The hydrology utilized the following land use covers:

Land Use Cover	Runoff Index Number (Soil "A")	Pervious Ratio
Open Brush – Fair Cover	46	1
Park	32	0.85
Commercial	32	0.1

The pre-project unit hydrograph calculations utilized open brush, fair cover, with a pervious ratio of 1, which would be the most conservative for the project site since the project consists of existing roofs, driveways, streets, etc. The post-project condition utilized commercial land use for the onsite area and park land use for the basins, to be conservative. Even though the basins will be pervious, analyzing the basins with 15% imperviousness will result in conservative values for the preliminary stages.

The offsite area was analyzed based upon the land use maps. The San Bernardino County Land Use Plan has been included in Excerpt A and the City of Fontana General Plan Land Use Map has been included as Excerpt B. The land uses shown in this map were used to determine the curve numbers and pervious fractions of the sub-watershed areas. Three watershed areas designated as areas A, B, and C were analyzed. Area A is tributary to the westerly boundary, Area B is tributary to the northerly boundary, and Area C is tributary to the easterly boundary. The calculations have been included in Appendix A, and the hydrology map has been included as Exhibit A.

The onsite rational method analysis analyzed four watersheds (combined into two hydrology calcualtions). Area A, Area B, Area C, Area D, Area E and Area F. Areas A and B are tributary to the series of infiltration basins on the north and westerly sides, and Areas C and D are tributary to the subsurface infiltration basin. Area E is tributary to the westerly side of Jurupa Avenue. Area F (and the offsite Area C) are tributary to the easterly low point on Jurupa Avenue. Unit hydrograph calculations were performed for Areas AB and Areas CD for the pre-project and post-project 100-year storm events to determine the required volume to be stored in order to mitigate for increased runoff. The rational method time of concentration was used in the Unit Hydrograph calculations. Excerpt C includes a Technical Memorandum regarding the calculation of the pre-project condition time of concentration to be utilized in the pre-project condition unit hydrograph calculations.

The onsite rational method hydrology calculations have been included in Appendix B, and the onsite Rational method hydrology map has been included as Exhibit B. The pre-project and post-project unit hydrograph hydrology calculations have been included in Appendix C and D, respectively, and the unit hydrograph watershed map has been included as Exhibit C.

IV. HYDRAULICS AND INCREASED RUNOFF MITIGATION

The Bloomington Commerce Center incorporates subsurface storm drain to convey the flows within the project site. During the preliminary stages, the systems were sized using friction slope calculations to account for the ponded water within the basins.

The basin outlet structures were sized for the peak 100-year flow rate. Since the basins will be routed through structures to mitigate the outflows, this is considered a conservative calculation. The outlet structures were sized using the weir equation, and the lowest elevation for the tributary inlet(s) to the basin was used as a preliminary control to determine the maximum ponded depth within the basin. The weir flow line elevations were set at an elevation that would not impact the storage volume within the basins that will address water quality and hydromodification. The analyses for sizing the storm drains and outlet structures was an iterative analysis to ensure that the hydraulics functioned for all aspects of the systems.

Since the water quality volumes are greater than the increased runoff mitigation volumes, the water quality volumes set the minimum allowable flow line for the overflow weirs. The table below summarizes the water quality calculations determined in the Water Quality Management Plan:

DMA/Basin	Tributary Area (ac)	Design Capture Volume (ft^3)	Weir Flow Line Elevation	Depth	Treated Volume (Per WQMP)
A	3.08	12,531	1027.00	4.5	39,874
B1	4.35	17,697	1025.50	3.0	40,468
B2	6.02	24,491	1022.00	3.0	32,294
B3*	11.59	47,152	1018.00	2.0	44,254
B4	5.67	23,068	1017.00	4.0	72,633
C	25.93	105,492	1010.00	8.0	285,154

* Basin B3 has less treated volume than the design capture volume, however, this excess 2,898 cu. ft. of the design capture volume will overtop into Basin B4, where there is sufficient available volume to treat the design capture volume of DMA B4 and the excess from DMA B3.

Based upon the summary table above, the basins will not bypass the water quality volume. In order to ensure that the basins can adequately mitigate for increased runoff, the total available volume below the weir elevations was calculated and compared to the required mitigation volume to be stored. The following tables summarize the results:

DMA/ Basin	Weir Flow Line Elevation	Basin Volume Below Weir Flow Line Elevation (ft^3)	Basin Volume Below Weir Flow Line Elevation (ac-ft)	Total Available Mitigation Vol. (ac-ft)	Total Req'd Mitigation Vol (ac-ft) (see discussion below)
A	1027.00	49,330	1.1325	4.2976	2.2427
B1	1025.50	42,755	0.9815		
B2	1022.00	22,374	0.5136		
B3	1018.00	33,945	0.7793		
B4	1017.00	38,799	0.8907		

DMA/ Basin	Weir Flow Line Elevation	Basin Volume Below Weir Flow Line Elevation (ft^3)	Basin Volume Below Weir Flow Line Elevation (ac-ft)	Total Available Mitigation Vol. (ac-ft)	Total Req'd Mitigation Vol (ac-ft) (see discussion below)
C [1]	1010.00	133,471	1.813	1.813	1.7700

1 – NOTE: Basin C includes DMAs C and D. Since Basin C is subsurface, the water quality volume was not accounted for in the available storage volume (i.e. volume below elevation 1010.00 was not included in the increased runoff mitigation calculation) in order to be conservative during the preliminary stages. The system will be maximized during final engineering.

The required mitigation volume for each area (Area AB and Area CD) was determined by taking the difference in volume on the rising and recess limbs of the unit hydrograph where the existing condition flow rate occurs (or a flow rate close to but not greater than the existing flow rate). The calculations have been included in Appendix F.4, and are summarized below:

Area AB – Existing Condition Flow Rate = 24.57 ft^3/s

Time	Volume (ac-ft)	Flow Rate (ft^3/s)
16+00	6.1164	20.88
16+35	8.3591	24.28
	Volume Difference	**2.2427 ac-ft**

Area CD – Existing Condition Flow Rate = 29.81 ft^3/s

Time	Volume (ac-ft)	Flow Rate (ft^3/s)
16+00	5.9870	24.24
16+25	7.7570	26.79
	Volume Difference	**1.7700 ac-ft**

Based upon the analyses summarized below, the project has sufficient onsite volume to treat for increased runoff mitigation.

The storm drain systems were sized using soffit control spreadsheets, with the exception of Lines E and F. Additionally, in order to determine the downstream water surface elevation for Line 2, a normal depth calculation was performed to determine the depth within the pipe. Since the Line 2 system is a triple 24" Storm Drain, the flow rate in the normal depth calculations was divided by 3 in order to determine the depth in each pipe. Based upon the normal depth calculations, the depth within Line 2 (based upon a flow rate of 9.94 ft^3/s in each pipe) is 0.88 feet. Therefore, the starting water surface elevation for Line 2 is 108.78, and was used in the soffit control calculations. The upstream water surface elevation for Line 2 is 1009.85, which is less than the weir elevation of 1010.00, therefore the upstream water surface elevation will not impact the subsurface basin outflow. During final engineering, detailed basin routing calculations will be performed and those outflows will be utilized in the storm drain analyses.

The Line E system was analyzed as a triple 12" storm drain, and the normal depth calculations utilized 1/3 of the total tributary flow rate with a minimum slope 0.6%. The Line F system will convey a total of 56.99 ft^3/s, which will require a double 30" elliptical equivalent storm drain system. Using ½ the flow rate (29.50 ft^3/s) was used in the normal depth calculation using a 30" pipe. The system will be two elliptical pipes that are 30" RCP equivalents.

The Line 1 system will connect to a proposed storm drain system that will be constructed per the Bloomington Business Park Specific Plan and will discharge into the existing downstream basin located at the north east corner of Locust Avenue and 11th Street. The Line 1 system utilizes a downstream invert of 986.00 which was obtained from the topographic mapping of the basin, and the downstream water surface elevation of the soffit of a 108" storm drain was utilized. The Line 1 system collects flows from the westerly onsite area, and the offsite area tributary to the westerly boundary and northerly boundary of the project site.

The storm drain friction slope calculations, normal depth calculation, and basin outlet calculations have been included in Appendix E. The increased runoff mitigation calculations have been included in Appendix F.

VI. FINDINGS

The hydrology and hydraulic analyses evaluated the proposed development to determine the necessary drainage improvements required to mitigate flows for increased runoff. It has been concluded that:

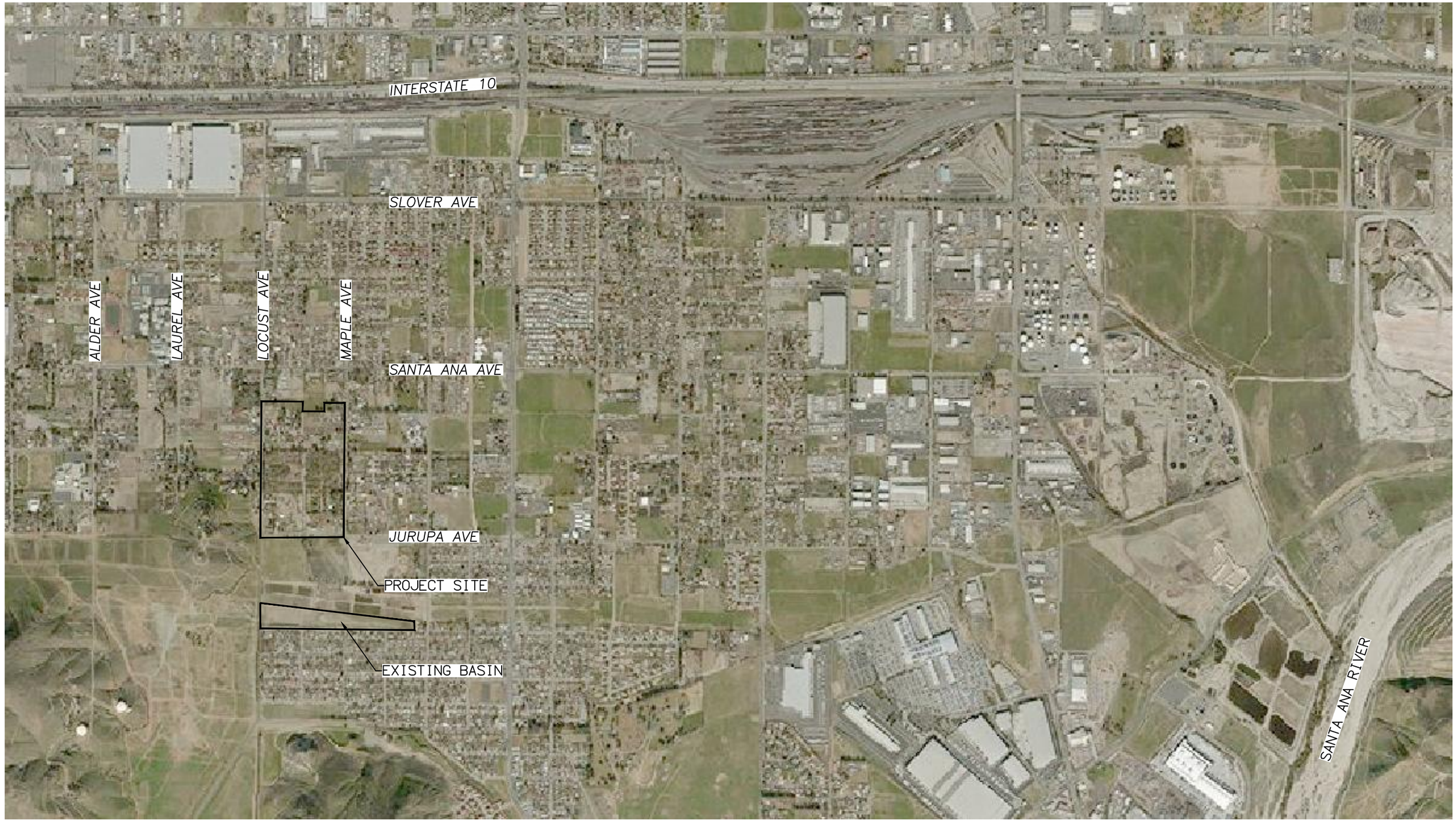
1. The proposed drainage facilities will adequately convey the 100-year flows and provide flood protection to the project site.
2. The proposed infiltration basins, infiltration trenches and subsurface system will adequately mitigate for increased runoff.

VII. REFERENCES

1. San Bernardino Flood Control Hydrology Manual, August 1986.

FIGURES

FIGURE 1: VICINITY MAP



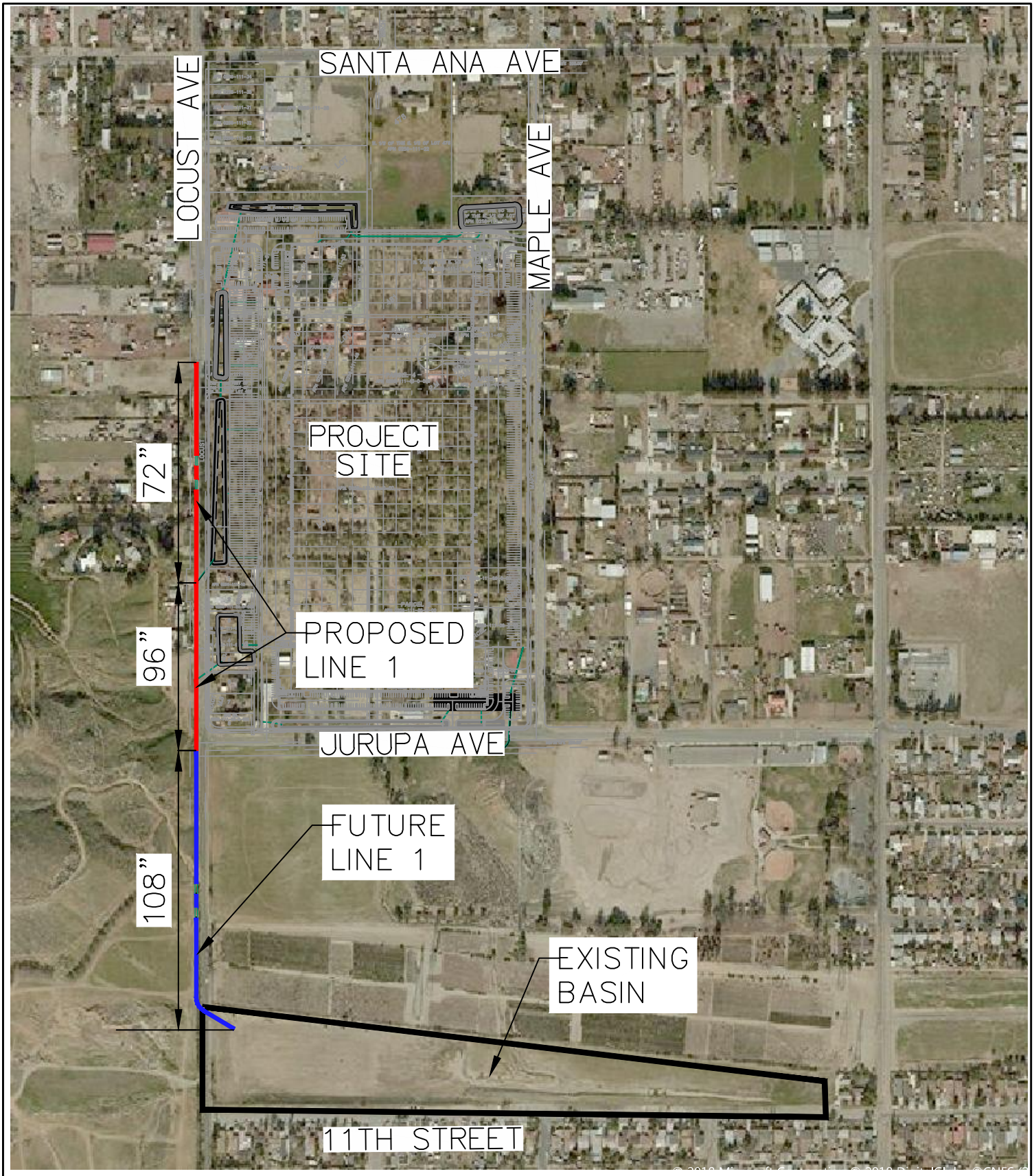
BLOOMINGTON COMMERCE CENTER
VICINITY MAP

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FIGURE 1

Drawing Name: O:\257.02.18\Engineering\WQMP\Exhibits and Figures\Figure 1-Vicinity Map.dwg
Last Opened: Mar 06, 2018 - 3:29pm by jcarver

FIGURE 2: ULTIMATE STORM DRAIN ALIGNMENT



BLOOMINGTON COMMERCE CENTER ULTIMATE STORM DRAIN ALIGNMENT

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FIGURE 2

APPENDICES

APPENDIX A: ULTIMATE CONDITION OFFSITE RATIONAL METHOD HYDROLOGY

APPENDIX A.1: RATIONAL METHOD ANALYSIS, AREA "A"

100-YEAR

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2014 Version 9.0
Rational Hydrology Study Date: 02/05/18

AREA A 100 YR RATIONAL METHOD
BLOOMINGTON PROJECT
FILENAME:ARA100

Program License Serial Number 6279

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.300 (In.)
Slope used for rainfall intensity curve b = 0.5000
Soil antecedent moisture condition (AMC) = 2

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Process from Point/Station 101.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****

RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 0.8000 Max loss rate(Fm)= 0.782(In/Hr)
Initial subarea data:
Initial area flow distance = 927.000(Ft.)
Top (of initial area) elevation = 1087.000(Ft.)
Bottom (of initial area) elevation = 1078.000(Ft.)
Difference in elevation = 9.000(Ft.)
Slope = 0.00971 s(%)= 0.97
TC = k(0.469)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 18.221 min.
Rainfall intensity = 2.359(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.602
Subarea runoff = 9.040(CFS)
Total initial stream area = 6.370(Ac.)
Pervious area fraction = 0.800
Initial area Fm value = 0.782(In/Hr)

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Process from Point/Station 102.000 to Point/Station 103.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1078.000(Ft.)
End of street segment elevation = 1071.000(Ft.)
Length of street segment = 626.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 20.000(Ft.)
Distance from crown to crossfall grade break = 18.500(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 [2] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 1.500(Ft.)

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Gutter hike from flowline =  1.500(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 =     15.695(CFS)
Depth of flow =   0.411(Ft.), Average velocity =   3.063(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  15.781(Ft.)
Flow velocity =   3.06(Ft/s)
Travel time =    3.41 min.     TC =   21.63  min.
 Adding area flow to street
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8000     Max loss rate(Fm)=     0.782(In/Hr)
Rainfall intensity =      2.165(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.575
Subarea runoff =     13.204(CFS) for   11.500(Ac.)
Total runoff =     22.244(CFS)
Effective area this stream =       17.87(Ac.)
Total Study Area (Main Stream No. 1) =       17.87(Ac.)
Area averaged Fm value =    0.782(In/Hr)
Street flow at end of street =     22.244(CFS)
Half street flow at end of street =     11.122(CFS)
Depth of flow =   0.456(Ft.), Average velocity =   3.338(Ft/s)
Flow width (from curb towards crown)=  18.057(Ft.)


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Process from Point/Station      103.000 to Point/Station      104.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1071.000(Ft.)
End of street segment elevation =  1064.000(Ft.)
Length of street segment  =   616.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     35.614(CFS)
Depth of flow =   0.525(Ft.), Average velocity =   3.796(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 =    1.26(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.80(Ft/s)
Travel time =    2.70 min.     TC =   24.33  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.7600     Max loss rate(Fm)=     0.743(In/Hr)
Rainfall intensity =      2.041(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.565
Subarea runoff =     26.611(CFS) for   24.480(Ac.)
Total runoff =     48.855(CFS)
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Effective area this stream =       42.35(Ac.)
Total Study Area (Main Stream No. 1) =       42.35(Ac.)
Area averaged Fm value =    0.760(In/Hr)
Street flow at end of street =     48.855(CFS)
Half street flow at end of street =     24.428(CFS)
Depth of flow =   0.581(Ft.), Average velocity =   4.105(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 =    4.04(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      105.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1064.000(Ft.)
End of street segment elevation =  1054.000(Ft.)
Length of street segment  =   985.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     64.957(CFS)
Depth of flow =   0.648(Ft.), Average velocity =   4.224(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 =    7.42(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   4.22(Ft/s)
Travel time =    3.89 min.     TC =   28.22  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8000     Max loss rate(Fm)=     0.782(In/Hr)
Rainfall intensity =      1.896(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.534
Subarea runoff =     32.011(CFS) for   37.490(Ac.)
Total runoff =     80.866(CFS)
Effective area this stream =       79.84(Ac.)
Total Study Area (Main Stream No. 1) =       79.84(Ac.)
Area averaged Fm value =    0.770(In/Hr)
Street flow at end of street =     80.866(CFS)
Half street flow at end of street =     40.433(CFS)
Depth of flow =   0.696(Ft.), Average velocity =   4.461(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 =    9.82(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      105.000 to Point/Station      106.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1054.000(Ft.)
End of street segment elevation =  1041.000(Ft.)
Length of street segment  =  1949.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
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Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     97.097(CFS)
Depth of flow =   0.778(Ft.), Average velocity =   4.222(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 =   13.88(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   4.22(Ft/s)
Travel time =    7.69 min.     TC =   35.91  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8000     Max loss rate(Fm)=     0.782(In/Hr)
Rainfall intensity =      1.680(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.485
Subarea runoff =     32.315(CFS) for   59.120(Ac.)
Total runoff =    113.181(CFS)
Effective area this stream =      138.96(Ac.)
Total Study Area (Main Stream No. 1) =      138.96(Ac.)
Area averaged Fm value =    0.775(In/Hr)
Street flow at end of street =    113.181(CFS)
Half street flow at end of street =     56.590(CFS)
Depth of flow =   0.815(Ft.), Average velocity =   4.489(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 =   15.73(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      107.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1041.000(Ft.)
End of street segment elevation =  1039.000(Ft.)
Length of street segment  =   372.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =    123.230(CFS)
Depth of flow =   0.866(Ft.), Average velocity =   4.353(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 =   18.31(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   4.35(Ft/s)
```

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Travel time =    1.42 min.     TC =   37.34  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 40.10
Pervious ratio(Ap) = 0.7300     Max loss rate(Fm)=     0.668(In/Hr)
Rainfall intensity =      1.648(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.486
Subarea runoff =     19.957(CFS) for   27.230(Ac.)
Total runoff =    133.138(CFS)
Effective area this stream =      166.19(Ac.)
Total Study Area (Main Stream No. 1) =      166.19(Ac.)
Area averaged Fm value =    0.758(In/Hr)
Street flow at end of street =    133.138(CFS)
Half street flow at end of street =     66.569(CFS)
Depth of flow =   0.889(Ft.), Average velocity =   4.490(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 =   19.43(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      106.000 to Point/Station      106.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 38.40
Pervious ratio(Ap) = 0.6800     Max loss rate(Fm)=     0.633(In/Hr)
Time of concentration =    37.34 min.
Rainfall intensity =      1.648(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.492
Subarea runoff =     14.569(CFS) for   15.950(Ac.)
Total runoff =    147.706(CFS)
Effective area this stream =      182.14(Ac.)
Total Study Area (Main Stream No. 1) =      182.14(Ac.)
Area averaged Fm value =    0.747(In/Hr)


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Process from Point/Station      107.000 to Point/Station      116.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1039.000(Ft.)
End of street segment elevation =  1032.000(Ft.)
Length of street segment  =  1671.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =    167.821(CFS)
Depth of flow =   1.006(Ft.), Average velocity =   4.570(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 =   25.31(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   4.57(Ft/s)
Travel time =    6.09 min.     TC =   43.43  min.
```

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 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 48.80
Pervious ratio(Ap) = 0.7100     Max loss rate(Fm)=     0.585(In/Hr)
Rainfall intensity =      1.528(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.487
Subarea runoff =     40.072(CFS) for   70.380(Ac.)
Total runoff =    187.779(CFS)
Effective area this stream =      252.52(Ac.)
Total Study Area (Main Stream No. 1) =      252.52(Ac.)
Area averaged Fm value =    0.702(In/Hr)
Street flow at end of street =    187.779(CFS)
Half street flow at end of street =     93.889(CFS)
Depth of flow =   1.049(Ft.), Average velocity =   4.780(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 =   27.45(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      107.000 to Point/Station      116.000
**** CONFLUENCE OF MAIN STREAMS ****
____________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    252.520(Ac.)
Runoff from this stream =    187.779(CFS)
Time of concentration =   43.43 min.
Rainfall intensity =     1.528(In/Hr)
Area averaged loss rate (Fm) =    0.7018(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7559
Program is now starting with Main Stream No. 2


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Process from Point/Station      108.000 to Point/Station      109.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________________
APARTMENT subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.2000     Max loss rate(Fm)=     0.196(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1083.000(Ft.)
Bottom (of initial area) elevation =  1070.000(Ft.)
Difference in elevation =    13.000(Ft.)
Slope =    0.01300  s(%)=       1.30
TC = k(0.324)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.239 min.
Rainfall intensity =      2.878(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.839
Subarea runoff =     16.177(CFS)
Total initial stream area =        6.700(Ac.)
Pervious area fraction = 0.200
Initial area Fm value =    0.196(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 =  1070.000(Ft.)
End of street segment elevation =  1057.000(Ft.)
Length of street segment  =   911.400(Ft.)
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Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     33.295(CFS)
Depth of flow =   0.497(Ft.), Average velocity =   4.051(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   4.05(Ft/s)
Travel time =    3.75 min.     TC =   15.99  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.5200     Max loss rate(Fm)=     0.508(In/Hr)
Rainfall intensity =      2.518(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.746
Subarea runoff =     34.098(CFS) for   20.050(Ac.)
Total runoff =     50.275(CFS)
Effective area this stream =       26.75(Ac.)
Total Study Area (Main Stream No. 2) =      279.27(Ac.)
Area averaged Fm value =    0.430(In/Hr)
Street flow at end of street =     50.275(CFS)
Half street flow at end of street =     25.137(CFS)
Depth of flow =   0.565(Ft.), Average velocity =   4.503(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 =    3.26(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      110.000 to Point/Station      114.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1057.000(Ft.)
End of street segment elevation =  1046.000(Ft.)
Length of street segment  =  1504.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     61.305(CFS)
Depth of flow =   0.671(Ft.), Average velocity =   3.682(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 =    8.56(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.68(Ft/s)
Travel time =    6.81 min.     TC =   22.80  min.
```

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 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.6200     Max loss rate(Fm)=     0.606(In/Hr)
Rainfall intensity =      2.109(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.681
Subarea runoff =     21.956(CFS) for   23.520(Ac.)
Total runoff =     72.230(CFS)
Effective area this stream =       50.27(Ac.)
Total Study Area (Main Stream No. 2) =      302.79(Ac.)
Area averaged Fm value =    0.513(In/Hr)
Street flow at end of street =     72.230(CFS)
Half street flow at end of street =     36.115(CFS)
Depth of flow =   0.707(Ft.), Average velocity =   3.856(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 =   10.33(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      110.000 to Point/Station      114.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     50.270(Ac.)
Runoff from this stream =     72.230(CFS)
Time of concentration =   22.80 min.
Rainfall intensity =     2.109(In/Hr)
Area averaged loss rate (Fm) =    0.5125(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5241


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Process from Point/Station      111.000 to Point/Station      112.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.2200     Max loss rate(Fm)=     0.215(In/Hr)
Initial subarea data:
Initial area flow distance =   664.000(Ft.)
Top (of initial area) elevation =  1081.000(Ft.)
Bottom (of initial area) elevation =  1072.000(Ft.)
Difference in elevation =     9.000(Ft.)
Slope =    0.01355  s(%)=       1.36
TC = k(0.329)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.455 min.
Rainfall intensity =      3.114(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.838
Subarea runoff =     24.083(CFS)
Total initial stream area =        9.230(Ac.)
Pervious area fraction = 0.220
Initial area Fm value =    0.215(In/Hr)


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Process from Point/Station      112.000 to Point/Station      113.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1072.000(Ft.)
End of street segment elevation =  1064.000(Ft.)
Length of street segment  =   663.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
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Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     38.841(CFS)
Depth of flow =   0.535(Ft.), Average velocity =   3.967(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 =    1.74(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.97(Ft/s)
Travel time =    2.79 min.     TC =   13.24  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.7200     Max loss rate(Fm)=     0.704(In/Hr)
Rainfall intensity =      2.767(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.726
Subarea runoff =     29.374(CFS) for   17.370(Ac.)
Total runoff =     53.458(CFS)
Effective area this stream =       26.60(Ac.)
Total Study Area (Main Stream No. 2) =      329.39(Ac.)
Area averaged Fm value =    0.534(In/Hr)
Street flow at end of street =     53.458(CFS)
Half street flow at end of street =     26.729(CFS)
Depth of flow =   0.592(Ft.), Average velocity =   4.294(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 =    4.60(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      113.000 to Point/Station      114.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1064.000(Ft.)
End of street segment elevation =  1046.000(Ft.)
Length of street segment  =  1334.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     63.103(CFS)
Depth of flow =   0.613(Ft.), Average velocity =   4.667(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 =    5.67(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   4.67(Ft/s)
Travel time =    4.76 min.     TC =   18.00  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
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SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.7100     Max loss rate(Fm)=     0.694(In/Hr)
Rainfall intensity =      2.373(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.672
Subarea runoff =     19.121(CFS) for   18.900(Ac.)
Total runoff =     72.578(CFS)
Effective area this stream =       45.50(Ac.)
Total Study Area (Main Stream No. 2) =      348.29(Ac.)
Area averaged Fm value =    0.601(In/Hr)
Street flow at end of street =     72.578(CFS)
Half street flow at end of street =     36.289(CFS)
Depth of flow =   0.642(Ft.), Average velocity =   4.832(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 =    7.09(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      113.000 to Point/Station      114.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     45.500(Ac.)
Runoff from this stream =     72.578(CFS)
Time of concentration =   18.00 min.
Rainfall intensity =     2.373(In/Hr)
Area averaged loss rate (Fm) =    0.6008(In/Hr)
Area averaged Pervious ratio (Ap) = 0.6144
Summary of stream data:

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


1     72.23    50.270     22.80    0.513      2.109
2     72.58    45.500     18.00    0.601      2.373
Qmax(1) =
          1.000 *    1.000 *    72.230) +
          0.851 *    1.000 *    72.578) + =     133.992
Qmax(2) =
          1.165 *    0.790 *    72.230) +
          1.000 *    1.000 *    72.578) + =     139.062

Total of 2 streams to confluence:
Flow rates before confluence point:
      72.230      72.578
Maximum flow rates at confluence using above data:
      133.992      139.062
Area of streams before confluence:
       50.270       45.500
Effective area values after confluence:
       95.770       85.202
Results of confluence:
Total flow rate =    139.062(CFS)
Time of concentration =    18.005 min.
Effective stream area after confluence =     85.202(Ac.)
Study area average Pervious fraction(Ap) =  0.567
Study area average soil loss rate(Fm) =    0.554(In/Hr)
Study area total (this main stream) =      95.77(Ac.)


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Process from Point/Station      114.000 to Point/Station      115.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1046.000(Ft.)
End of street segment elevation =  1045.500(Ft.)
Length of street segment  =   639.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
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```
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =    142.265(CFS)
Depth of flow =   1.311(Ft.), Average velocity =   2.586(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 =   40.56(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.59(Ft/s)
Travel time =    4.12 min.     TC =   22.12  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8000     Max loss rate(Fm)=     0.782(In/Hr)
Rainfall intensity =      2.141(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.649
Subarea runoff =      6.288(CFS) for   19.380(Ac.)
Total runoff =    145.350(CFS)
Effective area this stream =      104.58(Ac.)
Total Study Area (Main Stream No. 2) =      367.67(Ac.)
Area averaged Fm value =    0.597(In/Hr)
Street flow at end of street =    145.350(CFS)
Half street flow at end of street =     72.675(CFS)
Depth of flow =   1.323(Ft.), Average velocity =   2.608(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 =   41.15(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      115.000 to Point/Station      116.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
____________________________________________________________________________
Top of street segment elevation =  1045.500(Ft.)
End of street segment elevation =  1032.000(Ft.)
Length of street segment  =  1036.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =    156.757(CFS)
Depth of flow =   0.812(Ft.), Average velocity =   6.251(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 =   15.61(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   6.25(Ft/s)
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Travel time =    2.76 min.     TC =   24.89  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.7700     Max loss rate(Fm)=     0.753(In/Hr)
Rainfall intensity =      2.019(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.618
Subarea runoff =     22.649(CFS) for   29.990(Ac.)
Total runoff =    167.999(CFS)
Effective area this stream =      134.57(Ac.)
Total Study Area (Main Stream No. 2) =      397.66(Ac.)
Area averaged Fm value =    0.631(In/Hr)
Street flow at end of street =    167.999(CFS)
Half street flow at end of street =     84.000(CFS)
Depth of flow =   0.830(Ft.), Average velocity =   6.427(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 =   16.50(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      115.000 to Point/Station      116.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    134.572(Ac.)
Runoff from this stream =    167.999(CFS)
Time of concentration =   24.89 min.
Rainfall intensity =     2.019(In/Hr)
Area averaged loss rate (Fm) =    0.6315(In/Hr)
Area averaged Pervious ratio (Ap) = 0.6458
Summary of stream data:

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


1    187.78   252.520     43.43    0.702      1.528
2    168.00   134.572     24.89    0.631      2.019
Qmax(1) =
          1.000 *    1.000 *   187.779) +
          0.646 *    1.000 *   167.999) + =     296.360
Qmax(2) =
          1.594 *    0.573 *   187.779) +
          1.000 *    1.000 *   167.999) + =     339.481

Total of 2 main streams to confluence:
Flow rates before confluence point:
     188.779     168.999
Maximum flow rates at confluence using above data:
      296.360      339.481
Area of streams before confluence:
      252.520      134.572
Effective area values after confluence:
      387.092      279.264


Results of confluence:
Total flow rate =    339.481(CFS)
Time of concentration =    24.885 min.
Effective stream area after confluence  =    279.264(Ac.)
Study area average Pervious fraction(Ap) =  0.718
Study area average soil loss rate(Fm) =    0.677(In/Hr)
Study area total =     387.09(Ac.)


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Process from Point/Station      116.000 to Point/Station      132.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
____________________________________________________________________________
Top of street segment elevation =  1032.000(Ft.)
End of street segment elevation =  1022.000(Ft.)
Length of street segment  =  1334.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =    339.548(CFS)
Depth of flow =   1.179(Ft.), Average velocity =   7.214(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 =   33.94(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   7.21(Ft/s)
Travel time =    3.08 min.     TC =   27.97  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 59.60
Pervious ratio(Ap) = 0.7900     Max loss rate(Fm)=     0.541(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =    325.609(CFS)
therefore the upstream flow rate of Q =    339.481(CFS) is being used
Rainfall intensity =      1.904(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.583
Subarea runoff =      0.000(CFS) for   14.080(Ac.)
Total runoff =    339.481(CFS)
Effective area this stream =      293.34(Ac.)
Total Study Area (Main Stream No. 1) =      411.74(Ac.)
Area averaged Fm value =    0.671(In/Hr)
Street flow at end of street =    339.481(CFS)
Half street flow at end of street =    169.741(CFS)
Depth of flow =   1.179(Ft.), Average velocity =   7.213(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 =   33.93(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      116.000 to Point/Station      132.000
**** CONFLUENCE OF MAIN STREAMS ****
____________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    293.344(Ac.)
Runoff from this stream =    339.481(CFS)
Time of concentration =   27.97 min.
Rainfall intensity =     1.904(In/Hr)
Area averaged loss rate (Fm) =    0.6708(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7211
Program is now starting with Main Stream No. 2


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Process from Point/Station      117.000 to Point/Station      118.000
**** INITIAL AREA EVALUATION ****
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COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   974.000(Ft.)
Top (of initial area) elevation =  1106.000(Ft.)
Bottom (of initial area) elevation =  1098.000(Ft.)
Difference in elevation =     8.000(Ft.)
Slope =    0.00821  s(%)=       0.82
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.456 min.
Rainfall intensity =      2.853(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.869
Subarea runoff =     14.160(CFS)
Total initial stream area =        5.710(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station      118.000 to Point/Station      119.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
Top of street segment elevation =  1098.000(Ft.)
End of street segment elevation =  1087.000(Ft.)
Length of street segment  =  1225.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     20.905(CFS)
Depth of flow =   0.463(Ft.), Average velocity =   3.027(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  18.390(Ft.)
Flow velocity =   3.03(Ft/s)
Travel time =    6.75 min.     TC =   19.20  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Rainfall intensity =      2.298(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.862
Subarea runoff =     13.365(CFS) for    8.190(Ac.)
Total runoff =     27.525(CFS)
Effective area this stream =       13.90(Ac.)
Total Study Area (Main Stream No. 2) =      425.64(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Street flow at end of street =     27.525(CFS)
Half street flow at end of street =     13.762(CFS)
Depth of flow =   0.503(Ft.), Average velocity =   3.260(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
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Distance that curb overflow reaches into property =    0.13(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      119.000 to Point/Station      120.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
Top of street segment elevation =  1087.000(Ft.)
End of street segment elevation =  1085.500(Ft.)
Length of street segment  =   280.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     42.764(CFS)
Depth of flow =   0.628(Ft.), Average velocity =   2.994(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 =    6.40(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.99(Ft/s)
Travel time =    1.56 min.     TC =   20.76  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Rainfall intensity =      2.210(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.860
Subarea runoff =     30.324(CFS) for   16.530(Ac.)
Total runoff =     57.849(CFS)
Effective area this stream =       30.43(Ac.)
Total Study Area (Main Stream No. 2) =      442.17(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Street flow at end of street =     57.849(CFS)
Half street flow at end of street =     28.924(CFS)
Depth of flow =   0.693(Ft.), Average velocity =   3.228(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 =    9.64(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      120.000 to Point/Station      121.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
Top of street segment elevation =  1085.500(Ft.)
End of street segment elevation =  1083.000(Ft.)
Length of street segment  =   695.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
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Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     73.146(CFS)
Depth of flow =   0.784(Ft.), Average velocity =   3.132(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 =   14.18(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.13(Ft/s)
Travel time =    3.70 min.     TC =   24.46  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Rainfall intensity =      2.036(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.857
Subarea runoff =     30.458(CFS) for   20.190(Ac.)
Total runoff =     88.307(CFS)
Effective area this stream =       50.62(Ac.)
Total Study Area (Main Stream No. 2) =      462.36(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Street flow at end of street =     88.307(CFS)
Half street flow at end of street =     44.154(CFS)
Depth of flow =   0.830(Ft.), Average velocity =   3.377(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 =   16.50(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      121.000 to Point/Station      122.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1083.000(Ft.)
End of street segment elevation =  1082.000(Ft.)
Length of street segment  =   670.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     98.967(CFS)
Depth of flow =   1.002(Ft.), Average velocity =   2.715(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 =   25.09(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.71(Ft/s)
Travel time =    4.11 min.     TC =   28.57  min.
 Adding area flow to street
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COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Rainfall intensity =      1.884(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.853
Subarea runoff =     21.162(CFS) for   17.480(Ac.)
Total runoff =    109.469(CFS)
Effective area this stream =       68.10(Ac.)
Total Study Area (Main Stream No. 2) =      479.84(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Street flow at end of street =    109.469(CFS)
Half street flow at end of street =     54.735(CFS)
Depth of flow =   1.040(Ft.), Average velocity =   2.827(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 =   26.99(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      122.000 to Point/Station      123.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1082.000(Ft.)
End of street segment elevation =  1081.000(Ft.)
Length of street segment  =   965.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =    124.173(CFS)
Depth of flow =   1.171(Ft.), Average velocity =   2.664(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 =   33.55(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.66(Ft/s)
Travel time =    6.04 min.     TC =   34.61  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Rainfall intensity =      1.712(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.849
Subarea runoff =     29.277(CFS) for   27.420(Ac.)
Total runoff =    138.747(CFS)
Effective area this stream =       95.52(Ac.)
Total Study Area (Main Stream No. 2) =      507.26(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Street flow at end of street =    138.747(CFS)
Half street flow at end of street =     69.373(CFS)
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Depth of flow =   1.224(Ft.), Average velocity =   2.785(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 =   36.22(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      123.000 to Point/Station      124.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1081.000(Ft.)
End of street segment elevation =  1076.000(Ft.)
Length of street segment  =  1326.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =    168.495(CFS)
Depth of flow =   1.027(Ft.), Average velocity =   4.435(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 =   26.37(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   4.44(Ft/s)
Travel time =    4.98 min.     TC =   39.59  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Rainfall intensity =      1.600(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.845
Subarea runoff =     59.371(CFS) for   50.980(Ac.)
Total runoff =    198.117(CFS)
Effective area this stream =      146.50(Ac.)
Total Study Area (Main Stream No. 2) =      558.24(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Street flow at end of street =    198.117(CFS)
Half street flow at end of street =     99.059(CFS)
Depth of flow =   1.092(Ft.), Average velocity =   4.732(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 =   29.60(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      124.000 to Point/Station      125.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1076.000(Ft.)
End of street segment elevation =  1060.000(Ft.)
Length of street segment  =  1288.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =    214.143(CFS)
Depth of flow =   0.906(Ft.), Average velocity =   6.981(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 =   20.28(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   6.98(Ft/s)
Travel time =    3.08 min.     TC =   42.67  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.6900     Max loss rate(Fm)=     0.675(In/Hr)
Rainfall intensity =      1.542(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.756
Subarea runoff =     31.898(CFS) for   50.810(Ac.)
Total runoff =    230.015(CFS)
Effective area this stream =      197.31(Ac.)
Total Study Area (Main Stream No. 2) =      609.05(Ac.)
Area averaged Fm value =    0.246(In/Hr)
Street flow at end of street =    230.015(CFS)
Half street flow at end of street =    115.008(CFS)
Depth of flow =   0.928(Ft.), Average velocity =   7.183(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 =   21.40(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      125.000 to Point/Station      126.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1060.000(Ft.)
End of street segment elevation =  1042.000(Ft.)
Length of street segment  =  1341.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =    241.807(CFS)
Depth of flow =   0.932(Ft.), Average velocity =   7.501(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 =   21.58(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   7.50(Ft/s)
Travel time =    2.98 min.     TC =   45.65  min.
 Adding area flow to street
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```
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.7200     Max loss rate(Fm)=     0.704(In/Hr)
Rainfall intensity =      1.490(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.699
Subarea runoff =     23.458(CFS) for   45.980(Ac.)
Total runoff =    253.473(CFS)
Effective area this stream =      243.29(Ac.)
Total Study Area (Main Stream No. 2) =      655.03(Ac.)
Area averaged Fm value =    0.333(In/Hr)
Street flow at end of street =    253.473(CFS)
Half street flow at end of street =    126.737(CFS)
Depth of flow =   0.947(Ft.), Average velocity =   7.643(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 =   22.35(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      126.000 to Point/Station      126.000
**** SUBAREA FLOW ADDITION ****
____________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.489(In/Hr)
Time of concentration =    45.65 min.
Rainfall intensity =      1.490(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.697
Subarea runoff =      5.859(CFS) for    6.500(Ac.)
Total runoff =    259.333(CFS)
Effective area this stream =      249.79(Ac.)
Total Study Area (Main Stream No. 2) =      661.53(Ac.)
Area averaged Fm value =    0.337(In/Hr)


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Process from Point/Station      126.000 to Point/Station      127.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
____________________________________________________________________________
Top of street segment elevation =  1042.000(Ft.)
End of street segment elevation =  1034.500(Ft.)
Length of street segment  =   635.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =    261.377(CFS)
Depth of flow =   0.979(Ft.), Average velocity =   7.447(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 =   23.96(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   7.45(Ft/s)
Travel time =    1.42 min.     TC =   47.07  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
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```
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8000     Max loss rate(Fm)=     0.782(In/Hr)
Rainfall intensity =      1.468(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.678
Subarea runoff =      3.910(CFS) for   14.600(Ac.)
Total runoff =    263.243(CFS)
Effective area this stream =      264.39(Ac.)
Total Study Area (Main Stream No. 2) =      676.13(Ac.)
Area averaged Fm value =    0.361(In/Hr)
Street flow at end of street =    263.243(CFS)
Half street flow at end of street =    131.621(CFS)
Depth of flow =   0.982(Ft.), Average velocity =   7.468(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 =   24.09(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      127.000 to Point/Station      131.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1034.500(Ft.)
End of street segment elevation =  1025.000(Ft.)
Length of street segment  =   931.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =    263.326(CFS)
Depth of flow =   1.008(Ft.), Average velocity =   7.148(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 =   25.41(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   7.15(Ft/s)
Travel time =    2.17 min.     TC =   49.24  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8000     Max loss rate(Fm)=     0.782(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =    261.767(CFS)
therefore the upstream flow rate of Q =    263.243(CFS) is being used
Rainfall intensity =      1.435(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.663
Subarea runoff =      0.000(CFS) for   10.740(Ac.)
Total runoff =    263.243(CFS)
Effective area this stream =      275.13(Ac.)
Total Study Area (Main Stream No. 2) =      686.87(Ac.)
Area averaged Fm value =    0.378(In/Hr)
Street flow at end of street =    263.243(CFS)
Half street flow at end of street =    131.621(CFS)
Depth of flow =   1.008(Ft.), Average velocity =   7.147(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 =   25.41(Ft.)
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Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      127.000 to Point/Station      131.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =    275.130(Ac.)
Runoff from this stream =    263.243(CFS)
Time of concentration =   49.24 min.
Rainfall intensity =     1.435(In/Hr)
Area averaged loss rate (Fm) =    0.3779(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3865


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Process from Point/Station      128.000 to Point/Station      129.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8000     Max loss rate(Fm)=     0.782(In/Hr)
Initial subarea data:
Initial area flow distance =   966.000(Ft.)
Top (of initial area) elevation =  1046.500(Ft.)
Bottom (of initial area) elevation =  1036.000(Ft.)
Difference in elevation =    10.500(Ft.)
Slope =    0.01087  s(%)=       1.09
TC = k(0.469)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   18.110 min.
Rainfall intensity =      2.366(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.602
Subarea runoff =      9.922(CFS)
Total initial stream area =        6.960(Ac.)
Pervious area fraction = 0.800
Initial area Fm value =    0.782(In/Hr)


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Process from Point/Station      129.000 to Point/Station      130.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1036.000(Ft.)
End of street segment elevation =  1031.500(Ft.)
Length of street segment  =   481.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     15.431(CFS)
Depth of flow =   0.420(Ft.), Average velocity =   2.852(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  16.229(Ft.)
Flow velocity =   2.85(Ft/s)
Travel time =    2.81 min.     TC =   20.92  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
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USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.7500     Max loss rate(Fm)=     0.733(In/Hr)
Rainfall intensity =      2.202(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.591
Subarea runoff =     10.887(CFS) for    9.020(Ac.)
Total runoff =     20.809(CFS)
Effective area this stream =       15.98(Ac.)
Total Study Area (Main Stream No. 2) =      702.85(Ac.)
Area averaged Fm value =    0.755(In/Hr)
Street flow at end of street =     20.809(CFS)
Half street flow at end of street =     10.405(CFS)
Depth of flow =   0.459(Ft.), Average velocity =   3.070(Ft/s)
Flow width (from curb towards crown)=  18.214(Ft.)


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Process from Point/Station      130.000 to Point/Station      131.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1031.500(Ft.)
End of street segment elevation =  1025.000(Ft.)
Length of street segment  =   915.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     23.966(CFS)
Depth of flow =   0.499(Ft.), Average velocity =   2.882(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.88(Ft/s)
Travel time =    5.29 min.     TC =   26.21  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8000     Max loss rate(Fm)=     0.782(In/Hr)
Rainfall intensity =      1.967(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.550
Subarea runoff =      6.123(CFS) for    8.910(Ac.)
Total runoff =     26.932(CFS)
Effective area this stream =       24.89(Ac.)
Total Study Area (Main Stream No. 2) =      711.76(Ac.)
Area averaged Fm value =    0.765(In/Hr)
Street flow at end of street =     26.932(CFS)
Half street flow at end of street =     13.466(CFS)
Depth of flow =   0.518(Ft.), Average velocity =   2.968(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 =    0.89(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      130.000 to Point/Station      131.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
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Stream flow area =     24.890(Ac.)
Runoff from this stream =     26.932(CFS)
Time of concentration =   26.21 min.
Rainfall intensity =     1.967(In/Hr)
Area averaged loss rate (Fm) =    0.7645(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7819
Summary of stream data:

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


1    263.24   275.130     49.24    0.378      1.435
2     26.93    24.890     26.21    0.765      1.967
Qmax(1) =
          1.000 *    1.000 *   263.243) +
          0.558 *    1.000 *    26.932) + =     278.263
Qmax(2) =
          1.503 *    0.532 *   263.243) +
          1.000 *    1.000 *    26.932) + =     237.569

Total of 2 streams to confluence:
Flow rates before confluence point:
     263.243      26.932
Maximum flow rates at confluence using above data:
      278.263      237.569
Area of streams before confluence:
      275.130       24.890
Effective area values after confluence:
      300.020      171.362
Results of confluence:
Total flow rate =    278.263(CFS)
Time of concentration =    49.237 min.
Effective stream area after confluence =    300.020(Ac.)
Study area average Pervious fraction(Ap) =  0.419
Study area average soil loss rate(Fm) =    0.410(In/Hr)
Study area total (this main stream) =     300.02(Ac.)


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Process from Point/Station      131.000 to Point/Station      132.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1025.000(Ft.)
End of street segment elevation =  1022.000(Ft.)
Length of street segment  =   274.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =    278.310(CFS)
Depth of flow =   1.016(Ft.), Average velocity =   7.464(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 =   25.79(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   7.46(Ft/s)
Travel time =    0.61 min.     TC =   49.85  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
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Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =    274.522(CFS)
therefore the upstream flow rate of Q =    278.263(CFS) is being used
Rainfall intensity =      1.426(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.641
Subarea runoff =      0.000(CFS) for    0.100(Ac.)
Total runoff =    278.263(CFS)
Effective area this stream =      300.12(Ac.)
Total Study Area (Main Stream No. 2) =      711.86(Ac.)
Area averaged Fm value =    0.410(In/Hr)
Street flow at end of street =    278.263(CFS)
Half street flow at end of street =    139.132(CFS)
Depth of flow =   1.016(Ft.), Average velocity =   7.464(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 =   25.78(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      131.000 to Point/Station      132.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    300.120(Ac.)
Runoff from this stream =    278.263(CFS)
Time of concentration =   49.85 min.
Rainfall intensity =     1.426(In/Hr)
Area averaged loss rate (Fm) =    0.4099(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4192
Summary of stream data:

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


1    339.48   293.344     27.97    0.671      1.904
2    278.26   300.120     49.85    0.410      1.426
Qmax(1) =
          1.000 *    1.000 *   339.481) +
          1.470 *    0.561 *   278.263) + =     569.004
Qmax(2) =
          0.613 *    1.000 *   339.481) +
          1.000 *    1.000 *   278.263) + =     486.202

Total of 2 main streams to confluence:
Flow rates before confluence point:
     340.481     279.263
Maximum flow rates at confluence using above data:
      569.004      486.202
Area of streams before confluence:
      293.344      300.120
Effective area values after confluence:
      461.722      593.464


Results of confluence:
Total flow rate =    569.004(CFS)
Time of concentration =    27.967 min.
Effective stream area after confluence  =    461.722(Ac.)
Study area average Pervious fraction(Ap) =  0.568
Study area average soil loss rate(Fm) =    0.539(In/Hr)
Study area total =     593.46(Ac.)
```

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Process from Point/Station      132.000 to Point/Station      133.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1022.000(Ft.)
End of street segment elevation =  1019.000(Ft.)
Length of street segment  =   400.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =    569.623(CFS)
Depth of flow =   1.464(Ft.), Average velocity =   8.874(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 =   48.21(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   8.87(Ft/s)
Travel time =    0.75 min.     TC =   28.72  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 67.80
Pervious ratio(Ap) = 0.7700     Max loss rate(Fm)=     0.436(In/Hr)
Rainfall intensity =      1.879(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.643
Subarea runoff =      1.058(CFS) for   10.120(Ac.)
Total runoff =    570.062(CFS)
Effective area this stream =      471.84(Ac.)
Total Study Area (Main Stream No. 1) =      721.98(Ac.)
Area averaged Fm value =    0.537(In/Hr)
Street flow at end of street =    570.062(CFS)
Half street flow at end of street =    285.031(CFS)
Depth of flow =   1.465(Ft.), Average velocity =   8.877(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 =   48.23(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)
End of computations, Total Study Area =          721.98 (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) = 0.594
Area averaged SCS curve number =  35.1
```

10-YEAR

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2014 Version 9.0
Rational Hydrology Study Date: 02/05/18

AREA A 10 YR RATIONAL METHOD
BLOOMINGTON PROJECT
FILENAME:ARA10

Program License Serial Number 6279

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

Rational hydrology study storm event year is 10.0
Computed rainfall intensity:
Storm year = 10.00 1 hour rainfall = 0.820 (In.)
Slope used for rainfall intensity curve b = 0.5000
Soil antecedent moisture condition (AMC) = 2

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Process from Point/Station 101.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****

RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 0.8000 Max loss rate(Fm)= 0.782(In/Hr)
Initial subarea data:
Initial area flow distance = 927.000(Ft.)
Top (of initial area) elevation = 1087.000(Ft.)
Bottom (of initial area) elevation = 1078.000(Ft.)
Difference in elevation = 9.000(Ft.)
Slope = 0.00971 s(%)= 0.97
TC = k(0.469)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 18.221 min.
Rainfall intensity = 1.488(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.427
Subarea runoff = 4.046(CFS)
Total initial stream area = 6.370(Ac.)
Pervious area fraction = 0.800
Initial area Fm value = 0.782(In/Hr)

++

Process from Point/Station 102.000 to Point/Station 103.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1078.000(Ft.)
End of street segment elevation = 1071.000(Ft.)
Length of street segment = 626.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 20.000(Ft.)
Distance from crown to crossfall grade break = 18.500(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 [2] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 1.500(Ft.)

```
Gutter hike from flowline =  1.500(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 =      6.600(CFS)
Depth of flow =   0.319(Ft.), Average velocity =   2.480(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  11.221(Ft.)
Flow velocity =   2.48(Ft/s)
Travel time =    4.21 min.     TC =   22.43  min.
 Adding area flow to street
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8000     Max loss rate(Fm)=     0.782(In/Hr)
Rainfall intensity =      1.341(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.375
Subarea runoff =      4.944(CFS) for   11.500(Ac.)
Total runoff =      8.990(CFS)
Effective area this stream =       17.87(Ac.)
Total Study Area (Main Stream No. 1) =       17.87(Ac.)
Area averaged Fm value =    0.782(In/Hr)
Street flow at end of street =      8.990(CFS)
Half street flow at end of street =      4.495(CFS)
Depth of flow =   0.349(Ft.), Average velocity =   2.673(Ft/s)
Flow width (from curb towards crown)=  12.690(Ft.)


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Process from Point/Station      103.000 to Point/Station      104.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1071.000(Ft.)
End of street segment elevation =  1064.000(Ft.)
Length of street segment  =   616.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     13.912(CFS)
Depth of flow =   0.395(Ft.), Average velocity =   2.992(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  15.012(Ft.)
Flow velocity =   2.99(Ft/s)
Travel time =    3.43 min.     TC =   25.86  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.7600     Max loss rate(Fm)=     0.743(In/Hr)
Rainfall intensity =      1.249(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.353
Subarea runoff =      9.665(CFS) for   24.480(Ac.)
Total runoff =     18.655(CFS)
Effective area this stream =       42.35(Ac.)
Total Study Area (Main Stream No. 1) =       42.35(Ac.)
Area averaged Fm value =    0.760(In/Hr)
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Street flow at end of street =     18.655(CFS)
Half street flow at end of street =      9.327(CFS)
Depth of flow =   0.431(Ft.), Average velocity =   3.216(Ft/s)
Flow width (from curb towards crown)=  16.820(Ft.)


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Process from Point/Station      104.000 to Point/Station      105.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
Top of street segment elevation =  1064.000(Ft.)
End of street segment elevation =  1054.000(Ft.)
Length of street segment  =   985.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     22.765(CFS)
Depth of flow =   0.466(Ft.), Average velocity =   3.237(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  18.560(Ft.)
Flow velocity =   3.24(Ft/s)
Travel time =    5.07 min.     TC =   30.93  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8000     Max loss rate(Fm)=     0.782(In/Hr)
Rainfall intensity =      1.142(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.293
Subarea runoff =      8.064(CFS) for   37.490(Ac.)
Total runoff =     26.719(CFS)
Effective area this stream =       79.84(Ac.)
Total Study Area (Main Stream No. 1) =       79.84(Ac.)
Area averaged Fm value =    0.770(In/Hr)
Street flow at end of street =     26.719(CFS)
Half street flow at end of street =     13.360(CFS)
Depth of flow =   0.490(Ft.), Average velocity =   3.368(Ft/s)
Flow width (from curb towards crown)=  19.736(Ft.)


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Process from Point/Station      105.000 to Point/Station      106.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
Top of street segment elevation =  1054.000(Ft.)
End of street segment elevation =  1041.000(Ft.)
Length of street segment  =  1949.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     26.796(CFS)
Depth of flow =   0.522(Ft.), Average velocity =   2.895(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 =    1.11(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.90(Ft/s)
Travel time =   11.22 min.     TC =   42.15  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8000     Max loss rate(Fm)=     0.782(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =     25.387(CFS)
therefore the upstream flow rate of Q =     26.719(CFS) is being used
Rainfall intensity =      0.978(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.187
Subarea runoff =      0.000(CFS) for   59.120(Ac.)
Total runoff =     26.719(CFS)
Effective area this stream =      138.96(Ac.)
Total Study Area (Main Stream No. 1) =      138.96(Ac.)
Area averaged Fm value =    0.775(In/Hr)
Street flow at end of street =     26.719(CFS)
Half street flow at end of street =     13.360(CFS)
Depth of flow =   0.522(Ft.), Average velocity =   2.893(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 =    1.09(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      107.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1041.000(Ft.)
End of street segment elevation =  1039.000(Ft.)
Length of street segment  =   372.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     28.027(CFS)
Depth of flow =   0.548(Ft.), Average velocity =   2.699(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 =    2.40(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.70(Ft/s)
Travel time =    2.30 min.     TC =   44.45  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 40.10
Pervious ratio(Ap) = 0.7300     Max loss rate(Fm)=     0.668(In/Hr)
Rainfall intensity =      0.953(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.196
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Subarea runoff =      4.255(CFS) for   27.230(Ac.)
Total runoff =     30.974(CFS)
Effective area this stream =      166.19(Ac.)
Total Study Area (Main Stream No. 1) =      166.19(Ac.)
Area averaged Fm value =    0.758(In/Hr)
Street flow at end of street =     30.974(CFS)
Half street flow at end of street =     15.487(CFS)
Depth of flow =   0.566(Ft.), Average velocity =   2.767(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 =    3.29(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      106.000 to Point/Station      106.000
**** SUBAREA FLOW ADDITION ****
_______________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 38.40
Pervious ratio(Ap) = 0.6800     Max loss rate(Fm)=     0.633(In/Hr)
Time of concentration =    44.45 min.
Rainfall intensity =      0.953(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.204
Subarea runoff =      4.376(CFS) for   15.950(Ac.)
Total runoff =     35.351(CFS)
Effective area this stream =      182.14(Ac.)
Total Study Area (Main Stream No. 1) =      182.14(Ac.)
Area averaged Fm value =    0.747(In/Hr)


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Process from Point/Station      107.000 to Point/Station      116.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
_______________________________________________________________________________
Top of street segment elevation =  1039.000(Ft.)
End of street segment elevation =  1032.000(Ft.)
Length of street segment  =  1671.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     35.406(CFS)
Depth of flow =   0.615(Ft.), Average velocity =   2.605(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 =    5.74(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.60(Ft/s)
Travel time =   10.69 min.     TC =   55.14  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 48.80
Pervious ratio(Ap) = 0.7100     Max loss rate(Fm)=     0.585(In/Hr)
Rainfall intensity =      0.855(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.220
Subarea runoff =     12.101(CFS) for   70.380(Ac.)
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Total runoff =     47.452(CFS)
Effective area this stream =      252.52(Ac.)
Total Study Area (Main Stream No. 1) =      252.52(Ac.)
Area averaged Fm value =    0.702(In/Hr)
Street flow at end of street =     47.452(CFS)
Half street flow at end of street =     23.726(CFS)
Depth of flow =   0.676(Ft.), Average velocity =   2.802(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 =    8.80(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      107.000 to Point/Station      116.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    252.520(Ac.)
Runoff from this stream =     47.452(CFS)
Time of concentration =   55.14 min.
Rainfall intensity =     0.855(In/Hr)
Area averaged loss rate (Fm) =    0.7018(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7559
Program is now starting with Main Stream No. 2


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Process from Point/Station      108.000 to Point/Station      109.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
APARTMENT subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.2000     Max loss rate(Fm)=     0.196(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1083.000(Ft.)
Bottom (of initial area) elevation =  1070.000(Ft.)
Difference in elevation =    13.000(Ft.)
Slope =    0.01300  s(%)=       1.30
TC = k(0.324)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.239 min.
Rainfall intensity =      1.816(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.803
Subarea runoff =      9.769(CFS)
Total initial stream area =        6.700(Ac.)
Pervious area fraction = 0.200
Initial area Fm value =    0.196(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 =  1070.000(Ft.)
End of street segment elevation =  1057.000(Ft.)
Length of street segment  =   911.400(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
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Gutter hike from flowline =  1.500(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 =     18.539(CFS)
Depth of flow =   0.416(Ft.), Average velocity =   3.498(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  16.058(Ft.)
Flow velocity =   3.50(Ft/s)
Travel time =    4.34 min.     TC =   16.58  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.5200     Max loss rate(Fm)=     0.508(In/Hr)
Rainfall intensity =      1.560(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.652
Subarea runoff =     17.430(CFS) for   20.050(Ac.)
Total runoff =     27.198(CFS)
Effective area this stream =       26.75(Ac.)
Total Study Area (Main Stream No. 2) =      279.27(Ac.)
Area averaged Fm value =    0.430(In/Hr)
Street flow at end of street =     27.198(CFS)
Half street flow at end of street =     13.599(CFS)
Depth of flow =   0.467(Ft.), Average velocity =   3.845(Ft/s)
Flow width (from curb towards crown)=  18.616(Ft.)


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Process from Point/Station      110.000 to Point/Station      114.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
____________________________________________________________________________
Top of street segment elevation =  1057.000(Ft.)
End of street segment elevation =  1046.000(Ft.)
Length of street segment  =  1504.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     31.027(CFS)
Depth of flow =   0.539(Ft.), Average velocity =   3.108(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 =    1.95(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.11(Ft/s)
Travel time =    8.07 min.     TC =   24.65  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.6200     Max loss rate(Fm)=     0.606(In/Hr)
Rainfall intensity =      1.279(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.539
Subarea runoff =      7.499(CFS) for   23.520(Ac.)
Total runoff =     34.697(CFS)
Effective area this stream =       50.27(Ac.)
Total Study Area (Main Stream No. 2) =      302.79(Ac.)
Area averaged Fm value =    0.513(In/Hr)
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Street flow at end of street =     34.697(CFS)
Half street flow at end of street =     17.349(CFS)
Depth of flow =   0.559(Ft.), Average velocity =   3.195(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 =    2.93(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      114.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     50.270(Ac.)
Runoff from this stream =     34.697(CFS)
Time of concentration =   24.65 min.
Rainfall intensity =     1.279(In/Hr)
Area averaged loss rate (Fm) =    0.5125(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5241


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      112.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.2200     Max loss rate(Fm)=     0.215(In/Hr)
Initial subarea data:
Initial area flow distance =   664.000(Ft.)
Top (of initial area) elevation =  1081.000(Ft.)
Bottom (of initial area) elevation =  1072.000(Ft.)
Difference in elevation =     9.000(Ft.)
Slope =    0.01355  s(%)=       1.36
TC = k(0.329)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.455 min.
Rainfall intensity =      1.964(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.801
Subarea runoff =     14.531(CFS)
Total initial stream area =        9.230(Ac.)
Pervious area fraction = 0.220
Initial area Fm value =    0.215(In/Hr)


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Process from Point/Station      112.000 to Point/Station      113.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1072.000(Ft.)
End of street segment elevation =  1064.000(Ft.)
Length of street segment  =   663.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     21.473(CFS)
Depth of flow =   0.446(Ft.), Average velocity =   3.406(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  17.554(Ft.)
Flow velocity =   3.41(Ft/s)
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Travel time =    3.24 min.     TC =   13.70  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.7200     Max loss rate(Fm)=     0.704(In/Hr)
Rainfall intensity =      1.716(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.620
Subarea runoff =     13.758(CFS) for   17.370(Ac.)
Total runoff =     28.290(CFS)
Effective area this stream =       26.60(Ac.)
Total Study Area (Main Stream No. 2) =      329.39(Ac.)
Area averaged Fm value =    0.534(In/Hr)
Street flow at end of street =     28.290(CFS)
Half street flow at end of street =     14.145(CFS)
Depth of flow =   0.485(Ft.), Average velocity =   3.646(Ft/s)
Flow width (from curb towards crown)=  19.516(Ft.)


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Process from Point/Station      113.000 to Point/Station      114.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1064.000(Ft.)
End of street segment elevation =  1046.000(Ft.)
Length of street segment  =  1334.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     31.441(CFS)
Depth of flow =   0.493(Ft.), Average velocity =   3.903(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  19.892(Ft.)
Flow velocity =   3.90(Ft/s)
Travel time =    5.70 min.     TC =   19.40  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.7100     Max loss rate(Fm)=     0.694(In/Hr)
Rainfall intensity =      1.442(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.525
Subarea runoff =      6.167(CFS) for   18.900(Ac.)
Total runoff =     34.457(CFS)
Effective area this stream =       45.50(Ac.)
Total Study Area (Main Stream No. 2) =      348.29(Ac.)
Area averaged Fm value =    0.601(In/Hr)
Street flow at end of street =     34.457(CFS)
Half street flow at end of street =     17.228(CFS)
Depth of flow =   0.506(Ft.), Average velocity =   4.016(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 =    0.29(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      113.000 to Point/Station      114.000
**** CONFLUENCE OF MINOR STREAMS ****
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_____________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     45.500(Ac.)
Runoff from this stream =     34.457(CFS)
Time of concentration =   19.40 min.
Rainfall intensity =     1.442(In/Hr)
Area averaged loss rate (Fm) =    0.6008(In/Hr)
Area averaged Pervious ratio (Ap) = 0.6144
Summary of stream data:

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


1     34.70    50.270     24.65    0.513      1.279
2     34.46    45.500     19.40    0.601      1.442
Qmax(1) =
          1.000 *    1.000 *    34.697) +
          0.807 *    1.000 *    34.457) + =      62.487
Qmax(2) =
          1.212 *    0.787 *    34.697) +
          1.000 *    1.000 *    34.457) + =      67.559

Total of 2 streams to confluence:
Flow rates before confluence point:
      34.697      34.457
Maximum flow rates at confluence using above data:
       62.487       67.559
Area of streams before confluence:
       50.270       45.500
Effective area values after confluence:
       95.770       85.061
Results of confluence:
Total flow rate =     67.559(CFS)
Time of concentration =    19.396 min.
Effective stream area after confluence =     85.061(Ac.)
Study area average Pervious fraction(Ap) =  0.567
Study area average soil loss rate(Fm) =    0.554(In/Hr)
Study area total (this main stream) =      95.77(Ac.)


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Process from Point/Station      114.000 to Point/Station      115.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
_____________________________________________________________________
Top of street segment elevation =  1046.000(Ft.)
End of street segment elevation =  1045.500(Ft.)
Length of street segment  =   639.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     67.619(CFS)
Depth of flow =   0.981(Ft.), Average velocity =   1.921(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 =   24.05(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   1.92(Ft/s)
Travel time =    5.55 min.     TC =   24.94  min.
 Adding area flow to street
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Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8000     Max loss rate(Fm)=     0.782(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =     63.458(CFS)
therefore the upstream flow rate of Q =     67.559(CFS) is being used
Rainfall intensity =      1.272(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.478
Subarea runoff =      0.000(CFS) for   19.380(Ac.)
Total runoff =     67.559(CFS)
Effective area this stream =      104.44(Ac.)
Total Study Area (Main Stream No. 2) =      367.67(Ac.)
Area averaged Fm value =    0.597(In/Hr)
Street flow at end of street =     67.559(CFS)
Half street flow at end of street =     33.780(CFS)
Depth of flow =   0.981(Ft.), Average velocity =   1.920(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 =   24.04(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      115.000 to Point/Station      116.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1045.500(Ft.)
End of street segment elevation =  1032.000(Ft.)
Length of street segment  =  1036.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     67.635(CFS)
Depth of flow =   0.631(Ft.), Average velocity =   4.686(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 =    6.54(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   4.69(Ft/s)
Travel time =    3.68 min.     TC =   28.63  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.7700     Max loss rate(Fm)=     0.753(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =     67.220(CFS)
therefore the upstream flow rate of Q =     67.559(CFS) is being used
Rainfall intensity =      1.187(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.421
Subarea runoff =      0.000(CFS) for   29.990(Ac.)
Total runoff =     67.559(CFS)
Effective area this stream =      134.43(Ac.)
Total Study Area (Main Stream No. 2) =      397.66(Ac.)
Area averaged Fm value =    0.632(In/Hr)
Street flow at end of street =     67.559(CFS)
Half street flow at end of street =     33.780(CFS)
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Depth of flow =   0.631(Ft.), Average velocity =   4.685(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 =    6.53(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      115.000 to Point/Station      116.000
**** CONFLUENCE OF MAIN STREAMS ****
____________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    134.431(Ac.)
Runoff from this stream =     67.559(CFS)
Time of concentration =   28.63 min.
Rainfall intensity =     1.187(In/Hr)
Area averaged loss rate (Fm) =    0.6316(In/Hr)
Area averaged Pervious ratio (Ap) = 0.6459
Summary of stream data:

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


1     47.45   252.520     55.14    0.702      0.855
2     67.56   134.431     28.63    0.632      1.187
Qmax(1) =
          1.000 *    1.000 *    47.452) +
          0.403 *    1.000 *    67.559) + =      74.668
Qmax(2) =
          3.159 *    0.519 *    47.452) +
          1.000 *    1.000 *    67.559) + =     145.393

Total of 2 main streams to confluence:
Flow rates before confluence point:
      48.452      68.559
Maximum flow rates at confluence using above data:
       74.668      145.393
Area of streams before confluence:
      252.520      134.431
Effective area values after confluence:
      386.951      265.532


Results of confluence:
Total flow rate =    145.393(CFS)
Time of concentration =    28.626 min.
Effective stream area after confluence  =    265.532(Ac.)
Study area average Pervious fraction(Ap) =  0.718
Study area average soil loss rate(Fm) =    0.677(In/Hr)
Study area total =     386.95(Ac.)


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Process from Point/Station      116.000 to Point/Station      132.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
____________________________________________________________________________
Top of street segment elevation =  1032.000(Ft.)
End of street segment elevation =  1022.000(Ft.)
Length of street segment  =  1334.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
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 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 =    145.453(CFS)
Depth of flow =   0.866(Ft.), Average velocity =   5.139(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 =   18.30(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   5.14(Ft/s)
Travel time =    4.33 min.     TC =   32.95  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 59.60
Pervious ratio(Ap) = 0.7900     Max loss rate(Fm)=     0.541(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =    109.712(CFS)
therefore the upstream flow rate of Q =    145.393(CFS) is being used
Rainfall intensity =      1.106(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.355
Subarea runoff =      0.000(CFS) for   14.080(Ac.)
Total runoff =    145.393(CFS)
Effective area this stream =      279.61(Ac.)
Total Study Area (Main Stream No. 1) =      411.74(Ac.)
Area averaged Fm value =    0.671(In/Hr)
Street flow at end of street =    145.393(CFS)
Half street flow at end of street =     72.697(CFS)
Depth of flow =   0.866(Ft.), Average velocity =   5.138(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 =   18.29(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      116.000 to Point/Station      132.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    279.612(Ac.)
Runoff from this stream =    145.393(CFS)
Time of concentration =   32.95 min.
Rainfall intensity =     1.106(In/Hr)
Area averaged loss rate (Fm) =    0.6705(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7213
Program is now starting with Main Stream No. 2


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Process from Point/Station      117.000 to Point/Station      118.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   974.000(Ft.)
Top (of initial area) elevation =  1106.000(Ft.)
Bottom (of initial area) elevation =  1098.000(Ft.)
Difference in elevation =     8.000(Ft.)
Slope =    0.00821  s(%)=       0.82
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.456 min.
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Rainfall intensity =      1.800(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.851
Subarea runoff =      8.746(CFS)
Total initial stream area =        5.710(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station      118.000 to Point/Station      119.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1098.000(Ft.)
End of street segment elevation =  1087.000(Ft.)
Length of street segment  =  1225.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     12.712(CFS)
Depth of flow =   0.398(Ft.), Average velocity =   2.678(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  15.173(Ft.)
Flow velocity =   2.68(Ft/s)
Travel time =    7.62 min.     TC =   20.08  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Rainfall intensity =      1.417(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.838
Subarea runoff =      7.763(CFS) for    8.190(Ac.)
Total runoff =     16.509(CFS)
Effective area this stream =       13.90(Ac.)
Total Study Area (Main Stream No. 2) =      425.64(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Street flow at end of street =     16.509(CFS)
Half street flow at end of street =      8.254(CFS)
Depth of flow =   0.431(Ft.), Average velocity =   2.856(Ft/s)
Flow width (from curb towards crown)=  16.791(Ft.)


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Process from Point/Station      119.000 to Point/Station      120.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1087.000(Ft.)
End of street segment elevation =  1085.500(Ft.)
Length of street segment  =   280.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
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Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     25.573(CFS)
Depth of flow =   0.533(Ft.), Average velocity =   2.635(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 =    1.63(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.64(Ft/s)
Travel time =    1.77 min.     TC =   21.85  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Rainfall intensity =      1.359(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.835
Subarea runoff =     18.026(CFS) for   16.530(Ac.)
Total runoff =     34.535(CFS)
Effective area this stream =       30.43(Ac.)
Total Study Area (Main Stream No. 2) =      442.17(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Street flow at end of street =     34.535(CFS)
Half street flow at end of street =     17.267(CFS)
Depth of flow =   0.586(Ft.), Average velocity =   2.839(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 =    4.31(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      120.000 to Point/Station      121.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1085.500(Ft.)
End of street segment elevation =  1083.000(Ft.)
Length of street segment  =   695.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     43.328(CFS)
Depth of flow =   0.673(Ft.), Average velocity =   2.587(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 =    8.64(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.59(Ft/s)
Travel time =    4.48 min.     TC =   26.33  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
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Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Rainfall intensity =      1.238(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.829
Subarea runoff =     17.405(CFS) for   20.190(Ac.)
Total runoff =     51.939(CFS)
Effective area this stream =       50.62(Ac.)
Total Study Area (Main Stream No. 2) =      462.36(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Street flow at end of street =     51.939(CFS)
Half street flow at end of street =     25.970(CFS)
Depth of flow =   0.711(Ft.), Average velocity =   2.731(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 =   10.56(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      121.000 to Point/Station      122.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1083.000(Ft.)
End of street segment elevation =  1082.000(Ft.)
Length of street segment  =   670.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     57.747(CFS)
Depth of flow =   0.834(Ft.), Average velocity =   2.189(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 =   16.70(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.19(Ft/s)
Travel time =    5.10 min.     TC =   31.43  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Rainfall intensity =      1.133(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.822
Subarea runoff =     11.505(CFS) for   17.480(Ac.)
Total runoff =     63.445(CFS)
Effective area this stream =       68.10(Ac.)
Total Study Area (Main Stream No. 2) =      479.84(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Street flow at end of street =     63.445(CFS)
Half street flow at end of street =     31.722(CFS)
Depth of flow =   0.860(Ft.), Average velocity =   2.272(Ft/s)
Warning: depth of flow exceeds top of curb
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Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   17.98(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      122.000 to Point/Station      123.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
Top of street segment elevation =  1082.000(Ft.)
End of street segment elevation =  1081.000(Ft.)
Length of street segment  =   965.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     71.344(CFS)
Depth of flow =   0.951(Ft.), Average velocity =   2.135(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 =   22.56(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.13(Ft/s)
Travel time =    7.53 min.     TC =   38.97  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Rainfall intensity =      1.018(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.814
Subarea runoff =     15.624(CFS) for   27.420(Ac.)
Total runoff =     79.069(CFS)
Effective area this stream =       95.52(Ac.)
Total Study Area (Main Stream No. 2) =      507.26(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Street flow at end of street =     79.069(CFS)
Half street flow at end of street =     39.535(CFS)
Depth of flow =   0.987(Ft.), Average velocity =   2.224(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 =   24.34(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      123.000 to Point/Station      124.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
Top of street segment elevation =  1081.000(Ft.)
End of street segment elevation =  1076.000(Ft.)
Length of street segment  =  1326.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
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Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     95.439(CFS)
Depth of flow =   0.844(Ft.), Average velocity =   3.533(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 =   17.22(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.53(Ft/s)
Travel time =    6.25 min.     TC =   45.22  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Rainfall intensity =      0.945(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.810
Subarea runoff =     33.015(CFS) for   50.980(Ac.)
Total runoff =    112.084(CFS)
Effective area this stream =      146.50(Ac.)
Total Study Area (Main Stream No. 2) =      558.24(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Street flow at end of street =    112.084(CFS)
Half street flow at end of street =     56.042(CFS)
Depth of flow =   0.890(Ft.), Average velocity =   3.768(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 =   19.50(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      124.000 to Point/Station      125.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
____________________________________________________________________________
Top of street segment elevation =  1076.000(Ft.)
End of street segment elevation =  1060.000(Ft.)
Length of street segment  =  1288.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =    114.669(CFS)
Depth of flow =   0.746(Ft.), Average velocity =   5.438(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 =   12.29(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   5.44(Ft/s)
Travel time =    3.95 min.     TC =   49.17  min.
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 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.6900     Max loss rate(Fm)=     0.675(In/Hr)
Rainfall intensity =      0.906(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.673
Subarea runoff =      8.247(CFS) for   50.810(Ac.)
Total runoff =    120.331(CFS)
Effective area this stream =      197.31(Ac.)
Total Study Area (Main Stream No. 2) =      609.05(Ac.)
Area averaged Fm value =    0.246(In/Hr)
Street flow at end of street =    120.331(CFS)
Half street flow at end of street =     60.166(CFS)
Depth of flow =   0.756(Ft.), Average velocity =   5.543(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 =   12.80(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      125.000 to Point/Station      126.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1060.000(Ft.)
End of street segment elevation =  1042.000(Ft.)
Length of street segment  =  1341.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =    120.386(CFS)
Depth of flow =   0.748(Ft.), Average velocity =   5.675(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 =   12.39(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   5.67(Ft/s)
Travel time =    3.94 min.     TC =   53.11  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.7200     Max loss rate(Fm)=     0.704(In/Hr)
Rainfall intensity =      0.872(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.594
Subarea runoff =      5.551(CFS) for   45.980(Ac.)
Total runoff =    125.882(CFS)
Effective area this stream =      243.29(Ac.)
Total Study Area (Main Stream No. 2) =      655.03(Ac.)
Area averaged Fm value =    0.333(In/Hr)
Street flow at end of street =    125.882(CFS)
Half street flow at end of street =     62.941(CFS)
Depth of flow =   0.757(Ft.), Average velocity =   5.777(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 =   12.87(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)
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Process from Point/Station      126.000 to Point/Station      126.000
**** SUBAREA FLOW ADDITION ****
____________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.489(In/Hr)
Time of concentration =    53.11 min.
Rainfall intensity =      0.872(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.590
Subarea runoff =      2.549(CFS) for    6.500(Ac.)
Total runoff =    128.432(CFS)
Effective area this stream =      249.79(Ac.)
Total Study Area (Main Stream No. 2) =      661.53(Ac.)
Area averaged Fm value =    0.337(In/Hr)


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Process from Point/Station      126.000 to Point/Station      127.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
____________________________________________________________________________
Top of street segment elevation =  1042.000(Ft.)
End of street segment elevation =  1034.500(Ft.)
Length of street segment  =   635.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =    128.490(CFS)
Depth of flow =   0.776(Ft.), Average velocity =   5.605(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 =   13.82(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   5.61(Ft/s)
Travel time =    1.89 min.     TC =   55.00  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8000     Max loss rate(Fm)=     0.782(In/Hr)
Rainfall intensity =      0.857(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.567
Subarea runoff =      0.027(CFS) for   14.600(Ac.)
Total runoff =    128.459(CFS)
Effective area this stream =      264.39(Ac.)
Total Study Area (Main Stream No. 2) =      676.13(Ac.)
Area averaged Fm value =    0.361(In/Hr)
Street flow at end of street =    128.459(CFS)
Half street flow at end of street =     64.229(CFS)
Depth of flow =   0.776(Ft.), Average velocity =   5.605(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 =   13.81(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)
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Process from Point/Station      127.000 to Point/Station      131.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1034.500(Ft.)
End of street segment elevation =  1025.000(Ft.)
Length of street segment  =   931.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =    128.540(CFS)
Depth of flow =   0.794(Ft.), Average velocity =   5.365(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 =   14.68(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   5.37(Ft/s)
Travel time =    2.89 min.     TC =   57.89  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8000     Max loss rate(Fm)=     0.782(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =    126.823(CFS)
therefore the upstream flow rate of Q =    128.459(CFS) is being used
Rainfall intensity =      0.835(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.552
Subarea runoff =      0.000(CFS) for   10.740(Ac.)
Total runoff =    128.459(CFS)
Effective area this stream =      275.13(Ac.)
Total Study Area (Main Stream No. 2) =      686.87(Ac.)
Area averaged Fm value =    0.378(In/Hr)
Street flow at end of street =    128.459(CFS)
Half street flow at end of street =     64.229(CFS)
Depth of flow =   0.793(Ft.), Average velocity =   5.364(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 =   14.67(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      127.000 to Point/Station      131.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =    275.130(Ac.)
Runoff from this stream =    128.459(CFS)
Time of concentration =   57.89 min.
Rainfall intensity =     0.835(In/Hr)
Area averaged loss rate (Fm) =    0.3779(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3865


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Process from Point/Station      128.000 to Point/Station      129.000
**** INITIAL AREA EVALUATION ****
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```
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8000     Max loss rate(Fm)=     0.782(In/Hr)
Initial subarea data:
Initial area flow distance =   966.000(Ft.)
Top (of initial area) elevation =  1046.500(Ft.)
Bottom (of initial area) elevation =  1036.000(Ft.)
Difference in elevation =    10.500(Ft.)
Slope =    0.01087  s(%)=       1.09
TC = k(0.469)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   18.110 min.
Rainfall intensity =      1.493(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.428
Subarea runoff =      4.449(CFS)
Total initial stream area =        6.960(Ac.)
Pervious area fraction = 0.800
Initial area Fm value =    0.782(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      129.000 to Point/Station      130.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
Top of street segment elevation =  1036.000(Ft.)
End of street segment elevation =  1031.500(Ft.)
Length of street segment  =   481.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =      6.729(CFS)
Depth of flow =   0.329(Ft.), Average velocity =   2.329(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  11.719(Ft.)
Flow velocity =   2.33(Ft/s)
Travel time =    3.44 min.     TC =   21.55  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.7500     Max loss rate(Fm)=     0.733(In/Hr)
Rainfall intensity =      1.368(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.404
Subarea runoff =      4.374(CFS) for    9.020(Ac.)
Total runoff =      8.824(CFS)
Effective area this stream =       15.98(Ac.)
Total Study Area (Main Stream No. 2) =      702.85(Ac.)
Area averaged Fm value =    0.755(In/Hr)
Street flow at end of street =      8.824(CFS)
Half street flow at end of street =      4.412(CFS)
Depth of flow =   0.356(Ft.), Average velocity =   2.487(Ft/s)
Flow width (from curb towards crown)=  13.048(Ft.)


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Process from Point/Station      130.000 to Point/Station      131.000
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**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
Top of street segment elevation =  1031.500(Ft.)
End of street segment elevation =  1025.000(Ft.)
Length of street segment  =   915.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =      9.304(CFS)
Depth of flow =   0.376(Ft.), Average velocity =   2.271(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  14.062(Ft.)
Flow velocity =   2.27(Ft/s)
Travel time =    6.72 min.     TC =   28.27  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8000     Max loss rate(Fm)=     0.782(In/Hr)
Rainfall intensity =      1.195(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.324
Subarea runoff =      0.811(CFS) for    8.910(Ac.)
Total runoff =      9.635(CFS)
Effective area this stream =       24.89(Ac.)
Total Study Area (Main Stream No. 2) =      711.76(Ac.)
Area averaged Fm value =    0.765(In/Hr)
Street flow at end of street =      9.635(CFS)
Half street flow at end of street =      4.818(CFS)
Depth of flow =   0.380(Ft.), Average velocity =   2.290(Ft/s)
Flow width (from curb towards crown)=  14.256(Ft.)


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Process from Point/Station      130.000 to Point/Station      131.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     24.890(Ac.)
Runoff from this stream =      9.635(CFS)
Time of concentration =   28.27 min.
Rainfall intensity =     1.195(In/Hr)
Area averaged loss rate (Fm) =    0.7645(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7819
Summary of stream data:

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


1    128.46   275.130     57.89    0.378      0.835
2      9.64    24.890     28.27    0.765      1.195
Qmax(1) =
          1.000 *    1.000 *   128.459) +
          0.163 *    1.000 *     9.635) + =     130.034
Qmax(2) =
          1.787 *    0.488 *   128.459) +
          1.000 *    1.000 *     9.635) + =     121.766

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

```
     128.459       9.635
Maximum flow rates at confluence using above data:
      130.034      121.766
Area of streams before confluence:
      275.130       24.890
Effective area values after confluence:
      300.020      159.245
Results of confluence:
Total flow rate =    130.034(CFS)
Time of concentration =    57.887 min.
Effective stream area after confluence =    300.020(Ac.)
Study area average Pervious fraction(Ap) =  0.419
Study area average soil loss rate(Fm) =    0.410(In/Hr)
Study area total (this main stream) =     300.02(Ac.)


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Process from Point/Station      131.000 to Point/Station      132.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1025.000(Ft.)
End of street segment elevation =  1022.000(Ft.)
Length of street segment  =   274.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =    130.055(CFS)
Depth of flow =   0.788(Ft.), Average velocity =   5.506(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 =   14.40(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   5.51(Ft/s)
Travel time =    0.83 min.     TC =   58.72  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Rainfall intensity =      0.829(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.523
Subarea runoff =      0.008(CFS) for    0.100(Ac.)
Total runoff =    130.041(CFS)
Effective area this stream =      300.12(Ac.)
Total Study Area (Main Stream No. 2) =      711.86(Ac.)
Area averaged Fm value =    0.410(In/Hr)
Street flow at end of street =    130.041(CFS)
Half street flow at end of street =     65.021(CFS)
Depth of flow =   0.788(Ft.), Average velocity =   5.506(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 =   14.40(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      131.000 to Point/Station      132.000
**** CONFLUENCE OF MAIN STREAMS ****
____________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    300.120(Ac.)
Runoff from this stream =    130.041(CFS)
Time of concentration =   58.72 min.
Rainfall intensity =     0.829(In/Hr)
Area averaged loss rate (Fm) =    0.4099(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4192
Summary of stream data:

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


1    145.39   279.612     32.95    0.671      1.106
2    130.04   300.120     58.72    0.410      0.829
Qmax(1) =
          1.000 *    1.000 *   145.393) +
          1.662 *    0.561 *   130.041) + =     266.718
Qmax(2) =
          0.363 *    1.000 *   145.393) +
          1.000 *    1.000 *   130.041) + =     182.865

Total of 2 main streams to confluence:
Flow rates before confluence point:
     146.393     131.041
Maximum flow rates at confluence using above data:
      266.718      182.865
Area of streams before confluence:
      279.612      300.120
Effective area values after confluence:
      448.043      579.732


Results of confluence:
Total flow rate =    266.718(CFS)
Time of concentration =    32.952 min.
Effective stream area after confluence  =    448.043(Ac.)
Study area average Pervious fraction(Ap) =  0.565
Study area average soil loss rate(Fm) =    0.536(In/Hr)
Study area total =     579.73(Ac.)


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Process from Point/Station      132.000 to Point/Station      133.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
____________________________________________________________________________
Top of street segment elevation =  1022.000(Ft.)
End of street segment elevation =  1019.000(Ft.)
Length of street segment  =   400.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =    266.812(CFS)
Depth of flow =   1.073(Ft.), Average velocity =   6.552(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 =   28.65(Ft.)
```

```
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   6.55(Ft/s)
Travel time =    1.02 min.     TC =   33.97  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 67.80
Pervious ratio(Ap) = 0.7700     Max loss rate(Fm)=     0.436(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =    229.428(CFS)
therefore the upstream flow rate of Q =    266.718(CFS) is being used
Rainfall intensity =      1.090(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.459
Subarea runoff =      0.000(CFS) for   10.120(Ac.)
Total runoff =    266.718(CFS)
Effective area this stream =      458.16(Ac.)
Total Study Area (Main Stream No. 1) =      721.98(Ac.)
Area averaged Fm value =    0.533(In/Hr)
Street flow at end of street =    266.718(CFS)
Half street flow at end of street =    133.359(CFS)
Depth of flow =   1.073(Ft.), Average velocity =   6.551(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 =   28.64(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)
End of computations, Total Study Area =          721.98 (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) = 0.594
Area averaged SCS curve number =  35.1
```

APPENDIX A.2: RATIONAL METHOD ANALYSIS, AREA "B"

100-YEAR

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2014 Version 9.0
Rational Hydrology Study Date: 02/05/18

AREA B 100 YEAR RATIONAL METHOD
BLOOMINGTON PROJECT
FILENAME: ARB100

Program License Serial Number 6279

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.300 (In.)
Slope used for rainfall intensity curve b = 0.5000
Soil antecedent moisture condition (AMC) = 2

++

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

RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 0.5000 Max loss rate(Fm)= 0.489(In/Hr)
Initial subarea data:
Initial area flow distance = 768.000(Ft.)
Top (of initial area) elevation = 1063.000(Ft.)
Bottom (of initial area) elevation = 1056.000(Ft.)
Difference in elevation = 7.000(Ft.)
Slope = 0.00911 s(%)= 0.91
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 14.195 min.
Rainfall intensity = 2.673(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.735
Subarea runoff = 14.721(CFS)
Total initial stream area = 7.490(Ac.)
Pervious area fraction = 0.500
Initial area Fm value = 0.489(In/Hr)

++

Process from Point/Station 202.000 to Point/Station 203.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1056.000(Ft.)
End of street segment elevation = 1043.500(Ft.)
Length of street segment = 734.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 20.000(Ft.)
Distance from crown to crossfall grade break = 18.500(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 [2] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 1.500(Ft.)

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Gutter hike from flowline =  1.500(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 =     21.385(CFS)
Depth of flow =   0.423(Ft.), Average velocity =   3.874(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  16.398(Ft.)
Flow velocity =   3.87(Ft/s)
Travel time =    3.16 min.     TC =   17.35  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.489(In/Hr)
Rainfall intensity =      2.417(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.718
Subarea runoff =     13.204(CFS) for    8.600(Ac.)
Total runoff =     27.925(CFS)
Effective area this stream =       16.09(Ac.)
Total Study Area (Main Stream No. 1) =       16.09(Ac.)
Area averaged Fm value =    0.489(In/Hr)
Street flow at end of street =     27.925(CFS)
Half street flow at end of street =     13.962(CFS)
Depth of flow =   0.459(Ft.), Average velocity =   4.137(Ft/s)
Flow width (from curb towards crown)=  18.176(Ft.)


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Process from Point/Station      203.000 to Point/Station      205.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1043.500(Ft.)
End of street segment elevation =  1036.000(Ft.)
Length of street segment  =   568.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     30.373(CFS)
Depth of flow =   0.489(Ft.), Average velocity =   3.838(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  19.711(Ft.)
Flow velocity =   3.84(Ft/s)
Travel time =    2.47 min.     TC =   19.82  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8000     Max loss rate(Fm)=     0.782(In/Hr)
Rainfall intensity =      2.262(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.677
Subarea runoff =      4.754(CFS) for    5.260(Ac.)
Total runoff =     32.679(CFS)
Effective area this stream =       21.35(Ac.)
Total Study Area (Main Stream No. 1) =       21.35(Ac.)
Area averaged Fm value =    0.561(In/Hr)
Street flow at end of street =     32.679(CFS)
Half street flow at end of street =     16.339(CFS)
Depth of flow =   0.499(Ft.), Average velocity =   3.929(Ft/s)
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Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      203.000 to Point/Station      205.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     21.350(Ac.)
Runoff from this stream =     32.679(CFS)
Time of concentration =   19.82 min.
Rainfall intensity =     2.262(In/Hr)
Area averaged loss rate (Fm) =    0.5612(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5739


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Process from Point/Station      204.000 to Point/Station      205.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8000     Max loss rate(Fm)=     0.782(In/Hr)
Initial subarea data:
Initial area flow distance =   742.000(Ft.)
Top (of initial area) elevation =  1044.000(Ft.)
Bottom (of initial area) elevation =  1035.500(Ft.)
Difference in elevation =     8.500(Ft.)
Slope =    0.01146  s(%)=       1.15
TC = k(0.469)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   16.126 min.
Rainfall intensity =      2.508(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.619
Subarea runoff =      8.680(CFS)
Total initial stream area =        5.590(Ac.)
Pervious area fraction = 0.800
Initial area Fm value =    0.782(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      205.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      5.590(Ac.)
Runoff from this stream =      8.680(CFS)
Time of concentration =   16.13 min.
Rainfall intensity =     2.508(In/Hr)
Area averaged loss rate (Fm) =    0.7822(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8000
Summary of stream data:

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


1     32.68    21.350     19.82    0.561      2.262
2      8.68     5.590     16.13    0.782      2.508
Qmax(1) =
          1.000 *    1.000 *    32.679) +
          0.858 *    1.000 *     8.680) + =      40.123
Qmax(2) =
          1.144 *    0.814 *    32.679) +
          1.000 *    1.000 *     8.680) + =      39.110

Total of 2 streams to confluence:
```

```
Flow rates before confluence point:
      32.679       8.680
Maximum flow rates at confluence using above data:
       40.123       39.110
Area of streams before confluence:
       21.350        5.590
Effective area values after confluence:
       26.940       22.961
Results of confluence:
Total flow rate =     40.123(CFS)
Time of concentration =    19.820 min.
Effective stream area after confluence =     26.940(Ac.)
Study area average Pervious fraction(Ap) =  0.621
Study area average soil loss rate(Fm) =    0.607(In/Hr)
Study area total (this main stream) =      26.94(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      205.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 46.00
Pervious ratio(Ap) = 0.9000     Max loss rate(Fm)=     0.770(In/Hr)
Time of concentration =    19.82 min.
Rainfall intensity =      2.262(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.655
Subarea runoff =      1.947(CFS) for    1.450(Ac.)
Total runoff =     42.070(CFS)
Effective area this stream =       28.39(Ac.)
Total Study Area (Main Stream No. 1) =       28.39(Ac.)
Area averaged Fm value =    0.615(In/Hr)
End of computations, Total Study Area =           28.39 (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) = 0.635
Area averaged SCS curve number =  32.7
```

10-YEAR

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2014 Version 9.0
Rational Hydrology Study Date: 02/05/18

AREA B 10 YEAR RATIONAL METHOD
BLOOMINGTON PROJECT
FILENAME: ARB10

Program License Serial Number 6279

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

Rational hydrology study storm event year is 10.0
Computed rainfall intensity:
Storm year = 10.00 1 hour rainfall = 0.820 (In.)
Slope used for rainfall intensity curve b = 0.5000
Soil antecedent moisture condition (AMC) = 2

++

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

RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 0.5000 Max loss rate(Fm)= 0.489(In/Hr)
Initial subarea data:
Initial area flow distance = 768.000(Ft.)
Top (of initial area) elevation = 1063.000(Ft.)
Bottom (of initial area) elevation = 1056.000(Ft.)
Difference in elevation = 7.000(Ft.)
Slope = 0.00911 s(%)= 0.91
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 14.195 min.
Rainfall intensity = 1.686(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.639
Subarea runoff = 8.069(CFS)
Total initial stream area = 7.490(Ac.)
Pervious area fraction = 0.500
Initial area Fm value = 0.489(In/Hr)

++

Process from Point/Station 202.000 to Point/Station 203.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1056.000(Ft.)
End of street segment elevation = 1043.500(Ft.)
Length of street segment = 734.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 20.000(Ft.)
Distance from crown to crossfall grade break = 18.500(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 [2] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 1.500(Ft.)

```
Gutter hike from flowline =  1.500(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 =     11.461(CFS)
Depth of flow =   0.352(Ft.), Average velocity =   3.325(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  12.854(Ft.)
Flow velocity =   3.32(Ft/s)
Travel time =    3.68 min.     TC =   17.87  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.489(In/Hr)
Rainfall intensity =      1.502(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.607
Subarea runoff =      6.607(CFS) for    8.600(Ac.)
Total runoff =     14.676(CFS)
Effective area this stream =       16.09(Ac.)
Total Study Area (Main Stream No. 1) =       16.09(Ac.)
Area averaged Fm value =    0.489(In/Hr)
Street flow at end of street =     14.676(CFS)
Half street flow at end of street =      7.338(CFS)
Depth of flow =   0.378(Ft.), Average velocity =   3.532(Ft/s)
Flow width (from curb towards crown)=  14.165(Ft.)


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Process from Point/Station      203.000 to Point/Station      205.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1043.500(Ft.)
End of street segment elevation =  1036.000(Ft.)
Length of street segment  =   568.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     15.387(CFS)
Depth of flow =   0.398(Ft.), Average velocity =   3.246(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  15.163(Ft.)
Flow velocity =   3.25(Ft/s)
Travel time =    2.92 min.     TC =   20.79  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8000     Max loss rate(Fm)=     0.782(In/Hr)
Rainfall intensity =      1.393(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.537
Subarea runoff =      1.308(CFS) for    5.260(Ac.)
Total runoff =     15.983(CFS)
Effective area this stream =       21.35(Ac.)
Total Study Area (Main Stream No. 1) =       21.35(Ac.)
Area averaged Fm value =    0.561(In/Hr)
Street flow at end of street =     15.983(CFS)
Half street flow at end of street =      7.992(CFS)
Depth of flow =   0.403(Ft.), Average velocity =   3.276(Ft/s)
```

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Flow width (from curb towards crown)=  15.389(Ft.)


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Process from Point/Station      203.000 to Point/Station      205.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     21.350(Ac.)
Runoff from this stream =     15.983(CFS)
Time of concentration =   20.79 min.
Rainfall intensity =     1.393(In/Hr)
Area averaged loss rate (Fm) =    0.5612(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5739


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      205.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8000     Max loss rate(Fm)=     0.782(In/Hr)
Initial subarea data:
Initial area flow distance =   742.000(Ft.)
Top (of initial area) elevation =  1044.000(Ft.)
Bottom (of initial area) elevation =  1035.500(Ft.)
Difference in elevation =     8.500(Ft.)
Slope =    0.01146  s(%)=       1.15
TC = k(0.469)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   16.126 min.
Rainfall intensity =      1.582(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.455
Subarea runoff =      4.022(CFS)
Total initial stream area =        5.590(Ac.)
Pervious area fraction = 0.800
Initial area Fm value =    0.782(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      205.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      5.590(Ac.)
Runoff from this stream =      4.022(CFS)
Time of concentration =   16.13 min.
Rainfall intensity =     1.582(In/Hr)
Area averaged loss rate (Fm) =    0.7822(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8000
Summary of stream data:

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


1     15.98    21.350     20.79    0.561      1.393
2      4.02     5.590     16.13    0.782      1.582
Qmax(1) =
          1.000 *    1.000 *    15.983) +
          0.764 *    1.000 *     4.022) + =      19.056
Qmax(2) =
          1.227 *    0.776 *    15.983) +
          1.000 *    1.000 *     4.022) + =      19.232

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

```
      15.983       4.022
Maximum flow rates at confluence using above data:
       19.056       19.232
Area of streams before confluence:
       21.350        5.590
Effective area values after confluence:
       26.940       22.150
Results of confluence:
Total flow rate =     19.232(CFS)
Time of concentration =    16.126 min.
Effective stream area after confluence =     22.150(Ac.)
Study area average Pervious fraction(Ap) =  0.621
Study area average soil loss rate(Fm) =    0.607(In/Hr)
Study area total (this main stream) =      26.94(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      205.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 46.00
Pervious ratio(Ap) = 0.9000     Max loss rate(Fm)=     0.770(In/Hr)
Time of concentration =    16.13 min.
Rainfall intensity =      1.582(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.549
Subarea runoff =      1.257(CFS) for    1.450(Ac.)
Total runoff =     20.489(CFS)
Effective area this stream =       23.60(Ac.)
Total Study Area (Main Stream No. 1) =       28.39(Ac.)
Area averaged Fm value =    0.617(In/Hr)
End of computations, Total Study Area =           28.39 (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) = 0.635
Area averaged SCS curve number =  32.7
```

APPENDIX A.3: RATIONAL METHOD ANALYSIS, AREA "C"

100-YEAR

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2014 Version 9.0
Rational Hydrology Study Date: 02/05/18

AREA C 100 YR RATIONL METHOD ANALYSES
BLOOIMINGTON PROJECT
FILENAME: ARC100

Program License Serial Number 6279

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.300 (In.)
Slope used for rainfall intensity curve b = 0.5000
Soil antecedent moisture condition (AMC) = 2

++

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

RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 0.8000 Max loss rate(Fm)= 0.782(In/Hr)
Initial subarea data:
Initial area flow distance = 604.000(Ft.)
Top (of initial area) elevation = 1078.000(Ft.)
Bottom (of initial area) elevation = 1070.000(Ft.)
Difference in elevation = 8.000(Ft.)
Slope = 0.01325 s(%)= 1.32
TC = k(0.469)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 14.427 min.
Rainfall intensity = 2.651(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.634
Subarea runoff = 10.798(CFS)
Total initial stream area = 6.420(Ac.)
Pervious area fraction = 0.800
Initial area Fm value = 0.782(In/Hr)

++

Process from Point/Station 302.000 to Point/Station 304.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1070.000(Ft.)
End of street segment elevation = 1065.000(Ft.)
Length of street segment = 906.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 20.000(Ft.)
Distance from crown to crossfall grade break = 18.500(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 [2] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 1.500(Ft.)

```
Gutter hike from flowline =  1.500(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 =     13.996(CFS)
Depth of flow =   0.441(Ft.), Average velocity =   2.282(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  17.306(Ft.)
Flow velocity =   2.28(Ft/s)
Travel time =    6.62 min.     TC =   21.04  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.489(In/Hr)
Rainfall intensity =      2.195(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.636
Subarea runoff =      6.272(CFS) for    5.800(Ac.)
Total runoff =     17.070(CFS)
Effective area this stream =       12.22(Ac.)
Total Study Area (Main Stream No. 1) =       12.22(Ac.)
Area averaged Fm value =    0.643(In/Hr)
Street flow at end of street =     17.070(CFS)
Half street flow at end of street =      8.535(CFS)
Depth of flow =   0.469(Ft.), Average velocity =   2.397(Ft/s)
Flow width (from curb towards crown)=  18.680(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      304.000
**** SUBAREA FLOW ADDITION ****
____________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.6100     Max loss rate(Fm)=     0.596(In/Hr)
Time of concentration =    21.04 min.
Rainfall intensity =      2.195(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.645
Subarea runoff =     13.496(CFS) for    9.380(Ac.)
Total runoff =     30.566(CFS)
Effective area this stream =       21.60(Ac.)
Total Study Area (Main Stream No. 1) =       21.60(Ac.)
Area averaged Fm value =    0.623(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      304.000 to Point/Station      305.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
____________________________________________________________________________
Top of street segment elevation =  1065.000(Ft.)
End of street segment elevation =  1043.000(Ft.)
Length of street segment  =  1472.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     34.406(CFS)
Depth of flow =   0.498(Ft.), Average velocity =   4.163(Ft/s)
Note:  depth of flow exceeds top of street crown.
```

```
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   4.16(Ft/s)
Travel time =    5.89 min.     TC =   26.94  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.489(In/Hr)
Rainfall intensity =      1.940(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.630
Subarea runoff =      7.570(CFS) for    9.590(Ac.)
Total runoff =     38.136(CFS)
Effective area this stream =       31.19(Ac.)
Total Study Area (Main Stream No. 1) =       31.19(Ac.)
Area averaged Fm value =    0.582(In/Hr)
Street flow at end of street =     38.136(CFS)
Half street flow at end of street =     19.068(CFS)
Depth of flow =   0.514(Ft.), Average velocity =   4.280(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 =    0.70(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      306.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1043.000(Ft.)
End of street segment elevation =  1035.000(Ft.)
Length of street segment  =   648.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     41.414(CFS)
Depth of flow =   0.544(Ft.), Average velocity =   4.065(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 =    2.19(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   4.07(Ft/s)
Travel time =    2.66 min.     TC =   29.59  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8000     Max loss rate(Fm)=     0.782(In/Hr)
Rainfall intensity =      1.851(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.595
Subarea runoff =      6.396(CFS) for    9.250(Ac.)
Total runoff =     44.532(CFS)
Effective area this stream =       40.44(Ac.)
Total Study Area (Main Stream No. 1) =       40.44(Ac.)
Area averaged Fm value =    0.628(In/Hr)
Street flow at end of street =     44.532(CFS)
Half street flow at end of street =     22.266(CFS)
Depth of flow =   0.556(Ft.), Average velocity =   4.139(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 =    2.82(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      306.000 to Point/Station      307.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1035.000(Ft.)
End of street segment elevation =  1014.000(Ft.)
Length of street segment  =  1947.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     48.728(CFS)
Depth of flow =   0.585(Ft.), Average velocity =   4.023(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 =    4.26(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   4.02(Ft/s)
Travel time =    8.07 min.     TC =   37.66  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8000     Max loss rate(Fm)=     0.782(In/Hr)
Rainfall intensity =      1.641(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.527
Subarea runoff =      8.262(CFS) for   20.590(Ac.)
Total runoff =     52.795(CFS)
Effective area this stream =       61.03(Ac.)
Total Study Area (Main Stream No. 1) =       61.03(Ac.)
Area averaged Fm value =    0.680(In/Hr)
Street flow at end of street =     52.795(CFS)
Half street flow at end of street =     26.397(CFS)
Depth of flow =   0.600(Ft.), Average velocity =   4.104(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 =    5.02(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)
End of computations, Total Study Area =           61.03 (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) = 0.695
Area averaged SCS curve number =  32.0
```

10-YEAR

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2014 Version 9.0
Rational Hydrology Study Date: 02/05/18

AREA C 10 YR RATIONL METHOD ANALYSES
BLOOMINGTON PROJECT
FILENAME: ARC10

Program License Serial Number 6279

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

Rational hydrology study storm event year is 10.0
Computed rainfall intensity:
Storm year = 10.00 1 hour rainfall = 0.820 (In.)
Slope used for rainfall intensity curve b = 0.5000
Soil antecedent moisture condition (AMC) = 2

++

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

RESIDENTIAL(1 acre lot)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 0.8000 Max loss rate(Fm)= 0.782(In/Hr)
Initial subarea data:
Initial area flow distance = 604.000(Ft.)
Top (of initial area) elevation = 1078.000(Ft.)
Bottom (of initial area) elevation = 1070.000(Ft.)
Difference in elevation = 8.000(Ft.)
Slope = 0.01325 s(%)= 1.32
TC = k(0.469)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 14.427 min.
Rainfall intensity = 1.672(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.479
Subarea runoff = 5.142(CFS)
Total initial stream area = 6.420(Ac.)
Pervious area fraction = 0.800
Initial area Fm value = 0.782(In/Hr)

++

Process from Point/Station 302.000 to Point/Station 304.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1070.000(Ft.)
End of street segment elevation = 1065.000(Ft.)
Length of street segment = 906.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 20.000(Ft.)
Distance from crown to crossfall grade break = 18.500(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 [2] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 1.500(Ft.)

```
Gutter hike from flowline =  1.500(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 =      6.488(CFS)
Depth of flow =   0.352(Ft.), Average velocity =   1.890(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  12.826(Ft.)
Flow velocity =   1.89(Ft/s)
Travel time =    7.99 min.     TC =   22.42  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.489(In/Hr)
Rainfall intensity =      1.342(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.469
Subarea runoff =      2.540(CFS) for    5.800(Ac.)
Total runoff =      7.683(CFS)
Effective area this stream =       12.22(Ac.)
Total Study Area (Main Stream No. 1) =       12.22(Ac.)
Area averaged Fm value =    0.643(In/Hr)
Street flow at end of street =      7.683(CFS)
Half street flow at end of street =      3.841(CFS)
Depth of flow =   0.369(Ft.), Average velocity =   1.970(Ft/s)
Flow width (from curb towards crown)=  13.707(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      304.000
**** SUBAREA FLOW ADDITION ****
____________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.6100     Max loss rate(Fm)=     0.596(In/Hr)
Time of concentration =    22.42 min.
Rainfall intensity =      1.342(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.482
Subarea runoff =      6.290(CFS) for    9.380(Ac.)
Total runoff =     13.973(CFS)
Effective area this stream =       21.60(Ac.)
Total Study Area (Main Stream No. 1) =       21.60(Ac.)
Area averaged Fm value =    0.623(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      304.000 to Point/Station      305.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
____________________________________________________________________________
Top of street segment elevation =  1065.000(Ft.)
End of street segment elevation =  1043.000(Ft.)
Length of street segment  =  1472.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     15.263(CFS)
Depth of flow =   0.390(Ft.), Average velocity =   3.394(Ft/s)
Streetflow hydraulics at midpoint of street travel:
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```
Halfstreet flow width =  14.755(Ft.)
Flow velocity =   3.39(Ft/s)
Travel time =    7.23 min.     TC =   29.64  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.489(In/Hr)
Rainfall intensity =      1.167(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.451
Subarea runoff =      2.448(CFS) for    9.590(Ac.)
Total runoff =     16.421(CFS)
Effective area this stream =       31.19(Ac.)
Total Study Area (Main Stream No. 1) =       31.19(Ac.)
Area averaged Fm value =    0.582(In/Hr)
Street flow at end of street =     16.421(CFS)
Half street flow at end of street =      8.211(CFS)
Depth of flow =   0.399(Ft.), Average velocity =   3.456(Ft/s)
Flow width (from curb towards crown)=  15.181(Ft.)


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Process from Point/Station      305.000 to Point/Station      306.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
____________________________________________________________________________
Top of street segment elevation =  1043.000(Ft.)
End of street segment elevation =  1035.000(Ft.)
Length of street segment  =   648.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     16.984(CFS)
Depth of flow =   0.414(Ft.), Average velocity =   3.242(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  15.962(Ft.)
Flow velocity =   3.24(Ft/s)
Travel time =    3.33 min.     TC =   32.97  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8000     Max loss rate(Fm)=     0.782(In/Hr)
Rainfall intensity =      1.106(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.389
Subarea runoff =      0.998(CFS) for    9.250(Ac.)
Total runoff =     17.419(CFS)
Effective area this stream =       40.44(Ac.)
Total Study Area (Main Stream No. 1) =       40.44(Ac.)
Area averaged Fm value =    0.628(In/Hr)
Street flow at end of street =     17.419(CFS)
Half street flow at end of street =      8.710(CFS)
Depth of flow =   0.417(Ft.), Average velocity =   3.262(Ft/s)
Flow width (from curb towards crown)=  16.120(Ft.)


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Process from Point/Station      306.000 to Point/Station      307.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
____________________________________________________________________________
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Top of street segment elevation =  1035.000(Ft.)
End of street segment elevation =  1014.000(Ft.)
Length of street segment  =  1947.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(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 [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(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 =     17.489(CFS)
Depth of flow =   0.426(Ft.), Average velocity =   3.104(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  16.572(Ft.)
Flow velocity =   3.10(Ft/s)
Travel time =   10.46 min.     TC =   43.43  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8000     Max loss rate(Fm)=     0.782(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =     16.139(CFS)
therefore the upstream flow rate of Q =     17.419(CFS) is being used
Rainfall intensity =      0.964(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.274
Subarea runoff =      0.000(CFS) for   20.590(Ac.)
Total runoff =     17.419(CFS)
Effective area this stream =       61.03(Ac.)
Total Study Area (Main Stream No. 1) =       61.03(Ac.)
Area averaged Fm value =    0.680(In/Hr)
Street flow at end of street =     17.419(CFS)
Half street flow at end of street =      8.710(CFS)
Depth of flow =   0.426(Ft.), Average velocity =   3.100(Ft/s)
Flow width (from curb towards crown)=  16.547(Ft.)
End of computations, Total Study Area =           61.03 (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) = 0.695
Area averaged SCS curve number =  32.0
```

APPENDIX B: POST-PROJECT CONDITION ONSITE RATIONAL METHOD HYDROLOGY

APPENDIX B.1: RATIONAL METHOD ANALYSIS, AREAS "A" AND "B"

100-YEAR

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2014 Version 9.0
Rational Hydrology Study Date: 03/05/18

257.02.17 BLOOMINGTON
100-YEAR RATIONAL TABLING METHOD
POST-PROJECT CONDITION FOR AREAS "A" & "B"
FN: ARAB100.RSB

Program License Serial Number 6279

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.300 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

++

Process from Point/Station 101.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)
Initial subarea data:
Initial area flow distance = 288.000(Ft.)
Top (of initial area) elevation = 1032.000(Ft.)
Bottom (of initial area) elevation = 1028.860(Ft.)
Difference in elevation = 3.140(Ft.)
Slope = 0.01090 s(%)= 1.09
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 7.230 min.
Rainfall intensity = 4.628(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.881
Subarea runoff = 8.888(CFS)
Total initial stream area = 2.180(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.098(In/Hr)

++

Process from Point/Station 102.000 to Point/Station 103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1028.860(Ft.)
Downstream point/station elevation = 1024.280(Ft.)
Pipe length = 238.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 8.888(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 8.888(CFS)
Normal flow depth in pipe = 12.19(In.)
Flow top width inside pipe = 11.71(In.)
Critical Depth = 13.82(In.)
Pipe flow velocity = 8.32(Ft/s)
Travel time through pipe = 0.48 min.
Time of concentration (TC) = 7.71 min.

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
PARK subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Time of concentration =     7.71 min.
Rainfall intensity =      4.454(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 =      2.593(CFS) for    0.900(Ac.)
Total runoff =     11.481(CFS)
Effective area this stream =        3.08(Ac.)
Total Study Area (Main Stream No. 1) =        3.08(Ac.)
Area averaged Fm value =    0.312(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =  1024.280(Ft.)
Downstream point/station elevation =  1023.500(Ft.)
Pipe length  =   499.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.481(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    11.481(CFS)
Normal flow depth in pipe =   20.77(In.)
Flow top width inside pipe =   22.76(In.)
Critical Depth =   14.07(In.)
Pipe flow velocity =      3.50(Ft/s)
Travel time through pipe =    2.38 min.
Time of concentration (TC) =    10.08 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      203.000
**** CONFLUENCE OF MAIN STREAMS ****
_____________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      3.080(Ac.)
Runoff from this stream =     11.481(CFS)
Time of concentration =   10.08 min.
Rainfall intensity =     3.791(In/Hr)
Area averaged loss rate (Fm) =    0.3121(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3192
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   322.000(Ft.)
Top (of initial area) elevation =  1032.000(Ft.)
```

```
Bottom (of initial area) elevation =  1028.570(Ft.)
Difference in elevation =     3.430(Ft.)
Slope =    0.01065  s(%)=       1.07
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.595 min.
Rainfall intensity =      4.493(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.880
Subarea runoff =      8.307(CFS)
Total initial stream area =        2.100(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1028.570(Ft.)
Downstream point/station elevation =  1023.500(Ft.)
Pipe length  =   153.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.307(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     8.307(CFS)
Normal flow depth in pipe =    9.30(In.)
Flow top width inside pipe =   14.56(In.)
Critical Depth =   13.54(In.)
Pipe flow velocity =     10.39(Ft/s)
Travel time through pipe =    0.25 min.
Time of concentration (TC) =     7.84 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.100(Ac.)
Runoff from this stream =      8.307(CFS)
Time of concentration =    7.84 min.
Rainfall intensity =     4.408(In/Hr)
Area averaged loss rate (Fm) =    0.0978(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     11.48     3.080     10.08    0.312      3.791
2      8.31     2.100      7.84    0.098      4.408
Qmax(1) =
          1.000 *    1.000 *    11.481) +
          0.857 *    1.000 *     8.307) + =      18.598
Qmax(2) =
          1.177 *    0.778 *    11.481) +
          1.000 *    1.000 *     8.307) + =      18.819

Total of 2 main streams to confluence:
Flow rates before confluence point:
      12.481       9.307
Maximum flow rates at confluence using above data:
       18.598       18.819
Area of streams before confluence:
        3.080        2.100
Effective area values after confluence:
        5.180        4.495


Results of confluence:
Total flow rate =     18.819(CFS)
```

```
Time of concentration =     7.840 min.
Effective stream area after confluence  =      4.495(Ac.)
Study area average Pervious fraction(Ap) =  0.230
Study area average soil loss rate(Fm) =    0.225(In/Hr)
Study area total =       5.18(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      203.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =     7.84 min.
Rainfall intensity =      4.408(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.858
Subarea runoff =      1.710(CFS) for    0.930(Ac.)
Total runoff =     20.529(CFS)
Effective area this stream =        5.43(Ac.)
Total Study Area (Main Stream No. 1) =        6.11(Ac.)
Area averaged Fm value =    0.203(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      204.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1023.500(Ft.)
Downstream point/station elevation =  1022.500(Ft.)
Pipe length  =    26.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    20.529(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    20.529(CFS)
Normal flow depth in pipe =   14.70(In.)
Flow top width inside pipe =   13.94(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.29(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     7.87 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      204.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
PARK subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Time of concentration =     7.87 min.
Rainfall intensity =      4.397(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.833
Subarea runoff =      4.183(CFS) for    1.320(Ac.)
Total runoff =     24.712(CFS)
Effective area this stream =        6.75(Ac.)
Total Study Area (Main Stream No. 1) =        7.43(Ac.)
Area averaged Fm value =    0.326(In/Hr)


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Process from Point/Station      204.000 to Point/Station      205.000
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**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =  1022.500(Ft.)
Downstream point/station elevation =  1019.200(Ft.)
Pipe length  =   351.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    24.712(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    24.712(CFS)
Normal flow depth in pipe =   18.66(In.)
Flow top width inside pipe =   24.95(In.)
Critical Depth =   20.86(In.)
Pipe flow velocity =      8.43(Ft/s)
Travel time through pipe =    0.69 min.
Time of concentration (TC) =     8.57 min.


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Process from Point/Station      205.000 to Point/Station      208.000
**** IMPROVED CHANNEL TRAVEL TIME ****
_____________________________________________________________________
Upstream point elevation =  1019.200(Ft.)
Downstream point elevation =  1019.150(Ft.)
Channel length thru subarea  =    24.000(Ft.)
Channel base width     =   10.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.025
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     24.712(CFS)
Depth of flow =   0.892(Ft.), Average velocity =   2.185(Ft/s)
Channel flow top width =   15.352(Ft.)
Flow Velocity =    2.19(Ft/s)
Travel time  =    0.18 min.
Time of concentration =    8.75 min.
Critical depth =      0.543(Ft.)


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Process from Point/Station      205.000 to Point/Station      208.000
**** CONFLUENCE OF MAIN STREAMS ****
_____________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      6.745(Ac.)
Runoff from this stream =     24.712(CFS)
Time of concentration =    8.75 min.
Rainfall intensity =     4.127(In/Hr)
Area averaged loss rate (Fm) =    0.3262(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3336
Program is now starting with Main Stream No. 2


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Process from Point/Station      206.000 to Point/Station      207.000
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   446.000(Ft.)
Top (of initial area) elevation =  1034.110(Ft.)
Bottom (of initial area) elevation =  1025.180(Ft.)
Difference in elevation =     8.930(Ft.)
Slope =    0.02002  s(%)=       2.00
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.626 min.
```

```
Rainfall intensity =      4.482(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.880
Subarea runoff =      7.142(CFS)
Total initial stream area =        1.810(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      207.000 to Point/Station      208.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1025.180(Ft.)
Downstream point/station elevation =  1019.150(Ft.)
Pipe length  =   152.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.142(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     7.142(CFS)
Normal flow depth in pipe =    7.98(In.)
Flow top width inside pipe =   14.97(In.)
Critical Depth =   12.83(In.)
Pipe flow velocity =     10.76(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =     7.86 min.


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Process from Point/Station      207.000 to Point/Station      208.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.810(Ac.)
Runoff from this stream =      7.142(CFS)
Time of concentration =    7.86 min.
Rainfall intensity =     4.401(In/Hr)
Area averaged loss rate (Fm) =    0.0978(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     24.71     6.745      8.75    0.326      4.127
2      7.14     1.810      7.86    0.098      4.401
Qmax(1) =
          1.000 *    1.000 *    24.712) +
          0.936 *    1.000 *     7.142) + =      31.399
Qmax(2) =
          1.072 *    0.898 *    24.712) +
          1.000 *    1.000 *     7.142) + =      30.944

Total of 2 main streams to confluence:
Flow rates before confluence point:
      25.712       8.142
Maximum flow rates at confluence using above data:
       31.399       30.944
Area of streams before confluence:
        6.745        1.810
Effective area values after confluence:
        8.555        7.871


Results of confluence:
Total flow rate =     31.399(CFS)
Time of concentration =     8.750 min.
Effective stream area after confluence  =      8.555(Ac.)
Study area average Pervious fraction(Ap) =  0.284
Study area average soil loss rate(Fm) =    0.278(In/Hr)
Study area total =       8.56(Ac.)
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Process from Point/Station      208.000 to Point/Station      211.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =  1019.150(Ft.)
Downstream point elevation =  1019.000(Ft.)
Channel length thru subarea  =   250.000(Ft.)
Channel base width     =   10.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.025
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     31.399(CFS)
Depth of flow =   1.435(Ft.), Average velocity =   1.529(Ft/s)
Channel flow top width =   18.612(Ft.)
Flow Velocity =    1.53(Ft/s)
Travel time  =    2.72 min.
Time of concentration =   11.47 min.
Critical depth =      0.633(Ft.)


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Process from Point/Station      208.000 to Point/Station      211.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      8.555(Ac.)
Runoff from this stream =     31.399(CFS)
Time of concentration =   11.47 min.
Rainfall intensity =     3.507(In/Hr)
Area averaged loss rate (Fm) =    0.2779(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2842
Program is now starting with Main Stream No. 2


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Process from Point/Station      209.000 to Point/Station      210.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   528.000(Ft.)
Top (of initial area) elevation =  1032.000(Ft.)
Bottom (of initial area) elevation =  1023.500(Ft.)
Difference in elevation =     8.500(Ft.)
Slope =    0.01610  s(%)=       1.61
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.523 min.
Rainfall intensity =      4.193(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.879
Subarea runoff =     13.231(CFS)
Total initial stream area =        3.590(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      210.000 to Point/Station      211.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1023.500(Ft.)
Downstream point/station elevation =  1019.100(Ft.)
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Pipe length  =   153.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.231(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    13.231(CFS)
Normal flow depth in pipe =   11.55(In.)
Flow top width inside pipe =   17.26(In.)
Critical Depth =   16.30(In.)
Pipe flow velocity =     11.04(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =     8.75 min.


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Process from Point/Station      210.000 to Point/Station      211.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      3.590(Ac.)
Runoff from this stream =     13.231(CFS)
Time of concentration =    8.75 min.
Rainfall intensity =     4.126(In/Hr)
Area averaged loss rate (Fm) =    0.0978(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     31.40     8.555     11.47    0.278      3.507
2     13.23     3.590      8.75    0.098      4.126
Qmax(1) =
          1.000 *    1.000 *    31.399) +
          0.846 *    1.000 *    13.231) + =      42.598
Qmax(2) =
          1.192 *    0.763 *    31.399) +
          1.000 *    1.000 *    13.231) + =      41.771

Total of 2 main streams to confluence:
Flow rates before confluence point:
      32.399      14.231
Maximum flow rates at confluence using above data:
       42.598       41.771
Area of streams before confluence:
        8.555        3.590
Effective area values after confluence:
       12.145       10.116


Results of confluence:
Total flow rate =     42.598(CFS)
Time of concentration =    11.475 min.
Effective stream area after confluence  =     12.145(Ac.)
Study area average Pervious fraction(Ap) =  0.230
Study area average soil loss rate(Fm) =    0.225(In/Hr)
Study area total =      12.15(Ac.)


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Process from Point/Station      211.000 to Point/Station      212.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =  1019.100(Ft.)
Downstream point elevation =  1019.000(Ft.)
Channel length thru subarea  =    36.000(Ft.)
Channel base width     =   10.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.015
Maximum depth of channel  =    5.000(Ft.)
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Flow(q) thru subarea =     42.598(CFS)
Depth of flow =   0.838(Ft.), Average velocity =   4.060(Ft/s)
Channel flow top width =   15.030(Ft.)
Flow Velocity =    4.06(Ft/s)
Travel time  =    0.15 min.
Time of concentration =   11.62 min.
Critical depth =      0.766(Ft.)


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Process from Point/Station      212.000 to Point/Station      212.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
PARK subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =     37.068(CFS)
therefore the upstream flow rate of Q =     42.598(CFS) is being used
Time of concentration =    11.62 min.
Rainfall intensity =      3.481(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 =      0.000(CFS) for    0.620(Ac.)
Total runoff =     42.598(CFS)
Effective area this stream =       12.77(Ac.)
Total Study Area (Main Stream No. 1) =       13.45(Ac.)
Area averaged Fm value =    0.254(In/Hr)


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Process from Point/Station      212.000 to Point/Station      213.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1019.000(Ft.)
Downstream point/station elevation =  1016.200(Ft.)
Pipe length  =   108.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    42.598(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    42.598(CFS)
Normal flow depth in pipe =   19.20(In.)
Flow top width inside pipe =   24.48(In.)
Critical Depth =   25.46(In.)
Pipe flow velocity =     14.09(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =    11.75 min.


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Process from Point/Station      213.000 to Point/Station      216.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1016.200(Ft.)
Downstream point elevation =  1016.150(Ft.)
Channel length thru subarea  =   107.000(Ft.)
Channel base width     =   10.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.025
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     42.598(CFS)
Depth of flow =   1.806(Ft.), Average velocity =   1.530(Ft/s)
Channel flow top width =   20.834(Ft.)
Flow Velocity =    1.53(Ft/s)
Travel time  =    1.17 min.
Time of concentration =   12.92 min.
Critical depth =      0.766(Ft.)
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Process from Point/Station      213.000 to Point/Station      216.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     12.765(Ac.)
Runoff from this stream =     42.598(CFS)
Time of concentration =   12.92 min.
Rainfall intensity =     3.267(In/Hr)
Area averaged loss rate (Fm) =    0.2541(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2599
Program is now starting with Main Stream No. 2


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Process from Point/Station      214.000 to Point/Station      215.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   517.000(Ft.)
Top (of initial area) elevation =  1028.700(Ft.)
Bottom (of initial area) elevation =  1022.500(Ft.)
Difference in elevation =     6.200(Ft.)
Slope =    0.01199  s(%)=       1.20
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.964 min.
Rainfall intensity =      4.068(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.878
Subarea runoff =     12.576(CFS)
Total initial stream area =        3.520(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station      215.000 to Point/Station      216.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1022.500(Ft.)
Downstream point/station elevation =  1016.500(Ft.)
Pipe length  =   157.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.576(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    12.576(CFS)
Normal flow depth in pipe =   12.23(In.)
Flow top width inside pipe =   11.63(In.)
Critical depth could not be calculated.
Pipe flow velocity =     11.73(Ft/s)
Travel time through pipe =    0.22 min.
Time of concentration (TC) =     9.19 min.


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Process from Point/Station      215.000 to Point/Station      216.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      3.520(Ac.)
Runoff from this stream =     12.576(CFS)
Time of concentration =    9.19 min.
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Rainfall intensity =     4.008(In/Hr)
Area averaged loss rate (Fm) =    0.0978(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     42.60    12.765     12.92    0.254      3.267
2     12.58     3.520      9.19    0.098      4.008
Qmax(1) =
          1.000 *    1.000 *    42.598) +
          0.811 *    1.000 *    12.576) + =      52.792
Qmax(2) =
          1.246 *    0.711 *    42.598) +
          1.000 *    1.000 *    12.576) + =      50.328

Total of 2 main streams to confluence:
Flow rates before confluence point:
      43.598      13.576
Maximum flow rates at confluence using above data:
       52.792       50.328
Area of streams before confluence:
       12.765        3.520
Effective area values after confluence:
       16.285       12.600


Results of confluence:
Total flow rate =     52.792(CFS)
Time of concentration =    12.916 min.
Effective stream area after confluence  =     16.285(Ac.)
Study area average Pervious fraction(Ap) =  0.225
Study area average soil loss rate(Fm) =    0.220(In/Hr)
Study area total =      16.29(Ac.)


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Process from Point/Station      216.000 to Point/Station      219.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1016.500(Ft.)
Downstream point elevation =  1016.100(Ft.)
Channel length thru subarea  =   251.000(Ft.)
Channel base width     =   10.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.025
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     52.792(CFS)
Depth of flow =   1.460(Ft.), Average velocity =   2.515(Ft/s)
Channel flow top width =   18.758(Ft.)
Flow Velocity =    2.52(Ft/s)
Travel time  =    1.66 min.
Time of concentration =   14.58 min.
Critical depth =      0.867(Ft.)


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Process from Point/Station      216.000 to Point/Station      219.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     16.285(Ac.)
Runoff from this stream =     52.792(CFS)
Time of concentration =   14.58 min.
Rainfall intensity =     3.038(In/Hr)
Area averaged loss rate (Fm) =    0.2203(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2253
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Program is now starting with Main Stream No. 2


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Process from Point/Station      217.000 to Point/Station      218.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   517.000(Ft.)
Top (of initial area) elevation =  1027.800(Ft.)
Bottom (of initial area) elevation =  1021.800(Ft.)
Difference in elevation =     6.000(Ft.)
Slope =    0.01161  s(%)=       1.16
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.023 min.
Rainfall intensity =      4.052(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.878
Subarea runoff =     12.277(CFS)
Total initial stream area =        3.450(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station      218.000 to Point/Station      219.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1021.800(Ft.)
Downstream point/station elevation =  1016.100(Ft.)
Pipe length  =   159.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.277(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    12.277(CFS)
Normal flow depth in pipe =   10.23(In.)
Flow top width inside pipe =   17.83(In.)
Critical Depth =   15.90(In.)
Pipe flow velocity =     11.84(Ft/s)
Travel time through pipe =    0.22 min.
Time of concentration (TC) =     9.25 min.


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Process from Point/Station      218.000 to Point/Station      219.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      3.450(Ac.)
Runoff from this stream =     12.277(CFS)
Time of concentration =    9.25 min.
Rainfall intensity =     3.993(In/Hr)
Area averaged loss rate (Fm) =    0.0978(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     52.79    16.285     14.58    0.220      3.038
2     12.28     3.450      9.25    0.098      3.993
Qmax(1) =
          1.000 *    1.000 *    52.792) +
          0.755 *    1.000 *    12.277) + =      62.060
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Qmax(2) =
          1.339 *    0.634 *    52.792) +
          1.000 *    1.000 *    12.277) + =      57.101

Total of 2 main streams to confluence:
Flow rates before confluence point:
      53.792      13.277
Maximum flow rates at confluence using above data:
       62.060       57.101
Area of streams before confluence:
       16.285        3.450
Effective area values after confluence:
       19.735       13.779


Results of confluence:
Total flow rate =     62.060(CFS)
Time of concentration =    14.579 min.
Effective stream area after confluence  =     19.735(Ac.)
Study area average Pervious fraction(Ap) =  0.203
Study area average soil loss rate(Fm) =    0.199(In/Hr)
Study area total =      19.74(Ac.)


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Process from Point/Station      219.000 to Point/Station      222.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1016.100(Ft.)
Downstream point elevation =  1016.000(Ft.)
Channel length thru subarea  =   259.000(Ft.)
Channel base width     =   10.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.015
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     62.060(CFS)
Depth of flow =   1.769(Ft.), Average velocity =   2.292(Ft/s)
Channel flow top width =   20.613(Ft.)
Flow Velocity =    2.29(Ft/s)
Travel time  =    1.88 min.
Time of concentration =   16.46 min.
Critical depth =      0.961(Ft.)


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Process from Point/Station      219.000 to Point/Station      222.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     19.735(Ac.)
Runoff from this stream =     62.060(CFS)
Time of concentration =   16.46 min.
Rainfall intensity =     2.825(In/Hr)
Area averaged loss rate (Fm) =    0.1989(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2034
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      220.000 to Point/Station      221.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
```

```
Initial subarea data:
Initial area flow distance =   517.000(Ft.)
Top (of initial area) elevation =  1026.800(Ft.)
Bottom (of initial area) elevation =  1020.700(Ft.)
Difference in elevation =     6.100(Ft.)
Slope =    0.01180  s(%)=       1.18
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.993 min.
Rainfall intensity =      4.060(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.878
Subarea runoff =     12.302(CFS)
Total initial stream area =        3.450(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      221.000 to Point/Station      222.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1020.700(Ft.)
Downstream point/station elevation =  1016.000(Ft.)
Pipe length  =   144.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.302(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    12.302(CFS)
Normal flow depth in pipe =   10.55(In.)
Flow top width inside pipe =   17.73(In.)
Critical Depth =   15.90(In.)
Pipe flow velocity =     11.42(Ft/s)
Travel time through pipe =    0.21 min.
Time of concentration (TC) =     9.20 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      221.000 to Point/Station      222.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      3.450(Ac.)
Runoff from this stream =     12.302(CFS)
Time of concentration =    9.20 min.
Rainfall intensity =     4.004(In/Hr)
Area averaged loss rate (Fm) =    0.0978(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     62.06    19.735     16.46    0.199      2.825
2     12.30     3.450      9.20    0.098      4.004
Qmax(1) =
          1.000 *    1.000 *    62.060) +
          0.698 *    1.000 *    12.302) + =      70.648
Qmax(2) =
          1.449 *    0.559 *    62.060) +
          1.000 *    1.000 *    12.302) + =      62.579

Total of 2 main streams to confluence:
Flow rates before confluence point:
      63.060      13.302
Maximum flow rates at confluence using above data:
       70.648       62.579
Area of streams before confluence:
       19.735        3.450
Effective area values after confluence:
       23.185       14.483
```

```
Results of confluence:
Total flow rate =     70.648(CFS)
Time of concentration =    16.462 min.
Effective stream area after confluence  =     23.185(Ac.)
Study area average Pervious fraction(Ap) =  0.188
Study area average soil loss rate(Fm) =    0.184(In/Hr)
Study area total =      23.19(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      222.000 to Point/Station      222.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
PARK subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =     57.201(CFS)
therefore the upstream flow rate of Q =     70.648(CFS) is being used
Time of concentration =    16.46 min.
Rainfall intensity =      2.825(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.832
Subarea runoff =      0.000(CFS) for    1.170(Ac.)
Total runoff =     70.648(CFS)
Effective area this stream =       24.36(Ac.)
Total Study Area (Main Stream No. 1) =       25.04(Ac.)
Area averaged Fm value =    0.215(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      222.000 to Point/Station      226.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1016.000(Ft.)
Downstream point/station elevation =  1014.500(Ft.)
Pipe length  =   501.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    70.648(CFS)
Nearest computed pipe diameter  =     48.00(In.)
Calculated individual pipe flow  =    70.648(CFS)
Normal flow depth in pipe =   35.58(In.)
Flow top width inside pipe =   42.05(In.)
Critical Depth =   30.49(In.)
Pipe flow velocity =      7.08(Ft/s)
Travel time through pipe =    1.18 min.
Time of concentration (TC) =    17.64 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      222.000 to Point/Station      226.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     24.355(Ac.)
Runoff from this stream =     70.648(CFS)
Time of concentration =   17.64 min.
Rainfall intensity =     2.710(In/Hr)
Area averaged loss rate (Fm) =    0.2149(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2198
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      223.000 to Point/Station      224.000
**** INITIAL AREA EVALUATION ****
```

```
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   559.000(Ft.)
Top (of initial area) elevation =  1025.600(Ft.)
Bottom (of initial area) elevation =  1019.400(Ft.)
Difference in elevation =     6.200(Ft.)
Slope =    0.01109  s(%)=       1.11
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.394 min.
Rainfall intensity =      3.955(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.878
Subarea runoff =     17.183(CFS)
Total initial stream area =        4.950(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      224.000 to Point/Station      225.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1019.400(Ft.)
Downstream point/station elevation =  1014.700(Ft.)
Pipe length  =    87.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    17.183(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    17.183(CFS)
Normal flow depth in pipe =   11.13(In.)
Flow top width inside pipe =   17.49(In.)
Critical depth could not be calculated.
Pipe flow velocity =     14.96(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     9.49 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      225.000 to Point/Station      225.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
PARK subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Time of concentration =     9.49 min.
Rainfall intensity =      3.931(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.856
Subarea runoff =      1.900(CFS) for    0.720(Ac.)
Total runoff =     19.083(CFS)
Effective area this stream =        5.67(Ac.)
Total Study Area (Main Stream No. 2) =       30.71(Ac.)
Area averaged Fm value =    0.191(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      225.000 to Point/Station      226.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1014.700(Ft.)
Downstream point/station elevation =  1014.500(Ft.)
Pipe length  =   122.00(Ft.)   Manning's N = 0.013
```

```
No. of pipes = 1  Required pipe flow  =    19.083(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    19.083(CFS)
Normal flow depth in pipe =   24.28(In.)
Flow top width inside pipe =   29.10(In.)
Critical Depth =   17.25(In.)
Pipe flow velocity =      4.07(Ft/s)
Travel time through pipe =    0.50 min.
Time of concentration (TC) =     9.99 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      225.000 to Point/Station      226.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      5.670(Ac.)
Runoff from this stream =     19.083(CFS)
Time of concentration =    9.99 min.
Rainfall intensity =     3.812(In/Hr)
Area averaged loss rate (Fm) =    0.1909(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1952
Summary of stream data:

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


1     70.65    24.355     17.64    0.215      2.710
2     19.08     5.670      9.99    0.191      3.812
Qmax(1) =
          1.000 *    1.000 *    70.648) +
          0.696 *    1.000 *    19.083) + =      83.923
Qmax(2) =
          1.442 *    0.566 *    70.648) +
          1.000 *    1.000 *    19.083) + =      76.758

Total of 2 main streams to confluence:
Flow rates before confluence point:
      71.648      20.083
Maximum flow rates at confluence using above data:
       83.923       76.758
Area of streams before confluence:
       24.355        5.670
Effective area values after confluence:
       30.025       19.461


Results of confluence:
Total flow rate =     83.923(CFS)
Time of concentration =    17.642 min.
Effective stream area after confluence  =     30.025(Ac.)
Study area average Pervious fraction(Ap) =  0.215
Study area average soil loss rate(Fm) =    0.210(In/Hr)
Study area total =      30.03(Ac.)


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Process from Point/Station      226.000 to Point/Station      227.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1014.500(Ft.)
Downstream point/station elevation =  1014.000(Ft.)
Pipe length  =   410.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    83.923(CFS)
Nearest computed pipe diameter  =     60.00(In.)
Calculated individual pipe flow  =    83.923(CFS)
Normal flow depth in pipe =   45.47(In.)
Flow top width inside pipe =   51.41(In.)
Critical Depth =   31.17(In.)
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Pipe flow velocity =      5.26(Ft/s)
Travel time through pipe =    1.30 min.
Time of concentration (TC) =    18.94 min.
End of computations, Total Study Area =          30.71 (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) = 0.216
Area averaged SCS curve number =  32.0
```

10-YEAR

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2014 Version 9.0
Rational Hydrology Study Date: 03/05/18

257.02.17 BLOOMINGTON
10-YEAR RATIONAL TABLING METHOD
POST-PROJECT CONDITION FOR AREAS "A" & "B"
FN: ARAB10.RSB

Program License Serial Number 6279

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

Rational hydrology study storm event year is 10.0
Computed rainfall intensity:
Storm year = 10.00 1 hour rainfall = 0.821 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

++

Process from Point/Station 101.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)
Initial subarea data:
Initial area flow distance = 288.000(Ft.)
Top (of initial area) elevation = 1032.000(Ft.)
Bottom (of initial area) elevation = 1028.860(Ft.)
Difference in elevation = 3.140(Ft.)
Slope = 0.01090 s(%)= 1.09
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 7.230 min.
Rainfall intensity = 2.923(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff = 5.542(CFS)
Total initial stream area = 2.180(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.098(In/Hr)

++

Process from Point/Station 102.000 to Point/Station 103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1028.860(Ft.)
Downstream point/station elevation = 1024.280(Ft.)
Pipe length = 238.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 5.542(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 5.542(CFS)
Normal flow depth in pipe = 8.53(In.)
Flow top width inside pipe = 14.86(In.)
Critical Depth = 11.45(In.)
Pipe flow velocity = 7.69(Ft/s)
Travel time through pipe = 0.52 min.
Time of concentration (TC) = 7.75 min.

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Process from Point/Station      103.000 to Point/Station      103.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
PARK subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Time of concentration =     7.75 min.
Rainfall intensity =      2.804(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 =      1.366(CFS) for    0.900(Ac.)
Total runoff =      6.908(CFS)
Effective area this stream =        3.08(Ac.)
Total Study Area (Main Stream No. 1) =        3.08(Ac.)
Area averaged Fm value =    0.312(In/Hr)


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Process from Point/Station      103.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =  1024.280(Ft.)
Downstream point/station elevation =  1023.500(Ft.)
Pipe length  =   499.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.908(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =     6.908(CFS)
Normal flow depth in pipe =   15.82(In.)
Flow top width inside pipe =   22.75(In.)
Critical Depth =   11.19(In.)
Pipe flow velocity =      3.14(Ft/s)
Travel time through pipe =    2.65 min.
Time of concentration (TC) =    10.39 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      203.000
**** CONFLUENCE OF MAIN STREAMS ****
_____________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      3.080(Ac.)
Runoff from this stream =      6.908(CFS)
Time of concentration =   10.39 min.
Rainfall intensity =     2.351(In/Hr)
Area averaged loss rate (Fm) =    0.3121(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3192
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   322.000(Ft.)
Top (of initial area) elevation =  1032.000(Ft.)
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```
Bottom (of initial area) elevation =  1028.570(Ft.)
Difference in elevation =     3.430(Ft.)
Slope =    0.01065  s(%)=       1.07
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.595 min.
Rainfall intensity =      2.837(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.869
Subarea runoff =      5.178(CFS)
Total initial stream area =        2.100(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1028.570(Ft.)
Downstream point/station elevation =  1023.500(Ft.)
Pipe length  =   153.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.178(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     5.178(CFS)
Normal flow depth in pipe =    8.11(In.)
Flow top width inside pipe =   11.23(In.)
Critical Depth =   11.11(In.)
Pipe flow velocity =      9.17(Ft/s)
Travel time through pipe =    0.28 min.
Time of concentration (TC) =     7.87 min.


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Process from Point/Station      202.000 to Point/Station      203.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.100(Ac.)
Runoff from this stream =      5.178(CFS)
Time of concentration =    7.87 min.
Rainfall intensity =     2.777(In/Hr)
Area averaged loss rate (Fm) =    0.0978(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      6.91     3.080     10.39    0.312      2.351
2      5.18     2.100      7.87    0.098      2.777
Qmax(1) =
          1.000 *    1.000 *     6.908) +
          0.841 *    1.000 *     5.178) + =      11.262
Qmax(2) =
          1.209 *    0.758 *     6.908) +
          1.000 *    1.000 *     5.178) + =      11.505

Total of 2 main streams to confluence:
Flow rates before confluence point:
       7.908       6.178
Maximum flow rates at confluence using above data:
       11.262       11.505
Area of streams before confluence:
        3.080        2.100
Effective area values after confluence:
        5.180        4.433


Results of confluence:
Total flow rate =     11.505(CFS)
```

```
Time of concentration =     7.873 min.
Effective stream area after confluence  =      4.433(Ac.)
Study area average Pervious fraction(Ap) =  0.230
Study area average soil loss rate(Fm) =    0.225(In/Hr)
Study area total =       5.18(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      203.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =     7.87 min.
Rainfall intensity =      2.777(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.834
Subarea runoff =      0.918(CFS) for    0.930(Ac.)
Total runoff =     12.423(CFS)
Effective area this stream =        5.36(Ac.)
Total Study Area (Main Stream No. 1) =        6.11(Ac.)
Area averaged Fm value =    0.203(In/Hr)


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Process from Point/Station      203.000 to Point/Station      204.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1023.500(Ft.)
Downstream point/station elevation =  1022.500(Ft.)
Pipe length  =    26.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.423(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    12.423(CFS)
Normal flow depth in pipe =   12.05(In.)
Flow top width inside pipe =   11.93(In.)
Critical depth could not be calculated.
Pipe flow velocity =     11.77(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =     7.91 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      204.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
PARK subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Time of concentration =     7.91 min.
Rainfall intensity =      2.769(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.794
Subarea runoff =      2.265(CFS) for    1.320(Ac.)
Total runoff =     14.688(CFS)
Effective area this stream =        6.68(Ac.)
Total Study Area (Main Stream No. 1) =        7.43(Ac.)
Area averaged Fm value =    0.327(In/Hr)


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Process from Point/Station      204.000 to Point/Station      205.000
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**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =  1022.500(Ft.)
Downstream point/station elevation =  1019.200(Ft.)
Pipe length  =   351.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.688(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    14.688(CFS)
Normal flow depth in pipe =   16.43(In.)
Flow top width inside pipe =   17.33(In.)
Critical Depth =   17.05(In.)
Pipe flow velocity =      7.27(Ft/s)
Travel time through pipe =    0.80 min.
Time of concentration (TC) =     8.71 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      208.000
**** IMPROVED CHANNEL TRAVEL TIME ****
_____________________________________________________________________
Upstream point elevation =  1019.200(Ft.)
Downstream point elevation =  1019.150(Ft.)
Channel length thru subarea  =    24.000(Ft.)
Channel base width     =   10.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.025
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     14.688(CFS)
Depth of flow =   0.664(Ft.), Average velocity =   1.845(Ft/s)
Channel flow top width =   13.984(Ft.)
Flow Velocity =    1.84(Ft/s)
Travel time  =    0.22 min.
Time of concentration =    8.93 min.
Critical depth =      0.391(Ft.)


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Process from Point/Station      205.000 to Point/Station      208.000
**** CONFLUENCE OF MAIN STREAMS ****
_____________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      6.683(Ac.)
Runoff from this stream =     14.688(CFS)
Time of concentration =    8.93 min.
Rainfall intensity =     2.574(In/Hr)
Area averaged loss rate (Fm) =    0.3271(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3346
Program is now starting with Main Stream No. 2


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Process from Point/Station      206.000 to Point/Station      207.000
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   446.000(Ft.)
Top (of initial area) elevation =  1034.110(Ft.)
Bottom (of initial area) elevation =  1025.180(Ft.)
Difference in elevation =     8.930(Ft.)
Slope =    0.02002  s(%)=       2.00
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.626 min.
```

```
Rainfall intensity =      2.830(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.869
Subarea runoff =      4.451(CFS)
Total initial stream area =        1.810(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station      207.000 to Point/Station      208.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1025.180(Ft.)
Downstream point/station elevation =  1019.150(Ft.)
Pipe length  =   152.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.451(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     4.451(CFS)
Normal flow depth in pipe =    6.89(In.)
Flow top width inside pipe =   11.87(In.)
Critical Depth =   10.60(In.)
Pipe flow velocity =      9.54(Ft/s)
Travel time through pipe =    0.27 min.
Time of concentration (TC) =     7.89 min.


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Process from Point/Station      207.000 to Point/Station      208.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.810(Ac.)
Runoff from this stream =      4.451(CFS)
Time of concentration =    7.89 min.
Rainfall intensity =     2.773(In/Hr)
Area averaged loss rate (Fm) =    0.0978(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     14.69     6.683      8.93    0.327      2.574
2      4.45     1.810      7.89    0.098      2.773
Qmax(1) =
          1.000 *    1.000 *    14.688) +
          0.926 *    1.000 *     4.451) + =      18.809
Qmax(2) =
          1.088 *    0.884 *    14.688) +
          1.000 *    1.000 *     4.451) + =      18.576

Total of 2 main streams to confluence:
Flow rates before confluence point:
      15.688       5.451
Maximum flow rates at confluence using above data:
       18.809       18.576
Area of streams before confluence:
        6.683        1.810
Effective area values after confluence:
        8.493        7.715


Results of confluence:
Total flow rate =     18.809(CFS)
Time of concentration =     8.931 min.
Effective stream area after confluence  =      8.493(Ac.)
Study area average Pervious fraction(Ap) =  0.285
Study area average soil loss rate(Fm) =    0.278(In/Hr)
Study area total =       8.49(Ac.)
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Process from Point/Station      208.000 to Point/Station      211.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =  1019.150(Ft.)
Downstream point elevation =  1019.000(Ft.)
Channel length thru subarea  =   250.000(Ft.)
Channel base width     =   10.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.025
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     18.809(CFS)
Depth of flow =   1.084(Ft.), Average velocity =   1.309(Ft/s)
Channel flow top width =   16.506(Ft.)
Flow Velocity =    1.31(Ft/s)
Travel time  =    3.18 min.
Time of concentration =   12.11 min.
Critical depth =      0.457(Ft.)


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Process from Point/Station      208.000 to Point/Station      211.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      8.493(Ac.)
Runoff from this stream =     18.809(CFS)
Time of concentration =   12.11 min.
Rainfall intensity =     2.144(In/Hr)
Area averaged loss rate (Fm) =    0.2783(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2846
Program is now starting with Main Stream No. 2


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Process from Point/Station      209.000 to Point/Station      210.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   528.000(Ft.)
Top (of initial area) elevation =  1032.000(Ft.)
Bottom (of initial area) elevation =  1023.500(Ft.)
Difference in elevation =     8.500(Ft.)
Slope =    0.01610  s(%)=       1.61
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.523 min.
Rainfall intensity =      2.648(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.867
Subarea runoff =      8.239(CFS)
Total initial stream area =        3.590(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      210.000 to Point/Station      211.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1023.500(Ft.)
Downstream point/station elevation =  1019.100(Ft.)
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```
Pipe length  =   153.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.239(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     8.239(CFS)
Normal flow depth in pipe =    9.71(In.)
Flow top width inside pipe =   14.33(In.)
Critical Depth =   13.51(In.)
Pipe flow velocity =      9.80(Ft/s)
Travel time through pipe =    0.26 min.
Time of concentration (TC) =     8.78 min.


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Process from Point/Station      210.000 to Point/Station      211.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      3.590(Ac.)
Runoff from this stream =      8.239(CFS)
Time of concentration =    8.78 min.
Rainfall intensity =     2.601(In/Hr)
Area averaged loss rate (Fm) =    0.0978(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     18.81     8.493     12.11    0.278      2.144
2      8.24     3.590      8.78    0.098      2.601
Qmax(1) =
          1.000 *    1.000 *    18.809) +
          0.818 *    1.000 *     8.239) + =      25.546
Qmax(2) =
          1.245 *    0.725 *    18.809) +
          1.000 *    1.000 *     8.239) + =      25.211

Total of 2 main streams to confluence:
Flow rates before confluence point:
      19.809       9.239
Maximum flow rates at confluence using above data:
       25.546       25.211
Area of streams before confluence:
        8.493        3.590
Effective area values after confluence:
       12.083        9.747


Results of confluence:
Total flow rate =     25.546(CFS)
Time of concentration =    12.114 min.
Effective stream area after confluence  =     12.083(Ac.)
Study area average Pervious fraction(Ap) =  0.230
Study area average soil loss rate(Fm) =    0.225(In/Hr)
Study area total =      12.08(Ac.)


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Process from Point/Station      211.000 to Point/Station      212.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =  1019.100(Ft.)
Downstream point elevation =  1019.000(Ft.)
Channel length thru subarea  =    36.000(Ft.)
Channel base width     =   10.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.015
Maximum depth of channel  =    5.000(Ft.)
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Flow(q) thru subarea =     25.546(CFS)
Depth of flow =   0.626(Ft.), Average velocity =   3.433(Ft/s)
Channel flow top width =   13.759(Ft.)
Flow Velocity =    3.43(Ft/s)
Travel time  =    0.17 min.
Time of concentration =   12.29 min.
Critical depth =      0.555(Ft.)


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Process from Point/Station      212.000 to Point/Station      212.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
PARK subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =     21.397(CFS)
therefore the upstream flow rate of Q =     25.546(CFS) is being used
Time of concentration =    12.29 min.
Rainfall intensity =      2.126(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.792
Subarea runoff =      0.000(CFS) for    0.620(Ac.)
Total runoff =     25.546(CFS)
Effective area this stream =       12.70(Ac.)
Total Study Area (Main Stream No. 1) =       13.45(Ac.)
Area averaged Fm value =    0.254(In/Hr)


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Process from Point/Station      212.000 to Point/Station      213.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1019.000(Ft.)
Downstream point/station elevation =  1016.200(Ft.)
Pipe length  =   108.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    25.546(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    25.546(CFS)
Normal flow depth in pipe =   17.22(In.)
Flow top width inside pipe =   16.14(In.)
Critical depth could not be calculated.
Pipe flow velocity =     12.09(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =    12.44 min.


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Process from Point/Station      213.000 to Point/Station      216.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1016.200(Ft.)
Downstream point elevation =  1016.150(Ft.)
Channel length thru subarea  =   107.000(Ft.)
Channel base width     =   10.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.025
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     25.546(CFS)
Depth of flow =   1.374(Ft.), Average velocity =   1.317(Ft/s)
Channel flow top width =   18.241(Ft.)
Flow Velocity =    1.32(Ft/s)
Travel time  =    1.35 min.
Time of concentration =   13.79 min.
Critical depth =      0.555(Ft.)
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Process from Point/Station      213.000 to Point/Station      216.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     12.703(Ac.)
Runoff from this stream =     25.546(CFS)
Time of concentration =   13.79 min.
Rainfall intensity =     1.984(In/Hr)
Area averaged loss rate (Fm) =    0.2542(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2600
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      214.000 to Point/Station      215.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   517.000(Ft.)
Top (of initial area) elevation =  1028.700(Ft.)
Bottom (of initial area) elevation =  1022.500(Ft.)
Difference in elevation =     6.200(Ft.)
Slope =    0.01199  s(%)=       1.20
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.964 min.
Rainfall intensity =      2.569(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.866
Subarea runoff =      7.828(CFS)
Total initial stream area =        3.520(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station      215.000 to Point/Station      216.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1022.500(Ft.)
Downstream point/station elevation =  1016.500(Ft.)
Pipe length  =   157.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.828(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     7.828(CFS)
Normal flow depth in pipe =    8.54(In.)
Flow top width inside pipe =   14.85(In.)
Critical Depth =   13.28(In.)
Pipe flow velocity =     10.84(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =     9.21 min.


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Process from Point/Station      215.000 to Point/Station      216.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      3.520(Ac.)
Runoff from this stream =      7.828(CFS)
Time of concentration =    9.21 min.
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Rainfall intensity =     2.528(In/Hr)
Area averaged loss rate (Fm) =    0.0978(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     25.55    12.703     13.79    0.254      1.984
2      7.83     3.520      9.21    0.098      2.528
Qmax(1) =
          1.000 *    1.000 *    25.546) +
          0.776 *    1.000 *     7.828) + =      31.620
Qmax(2) =
          1.315 *    0.667 *    25.546) +
          1.000 *    1.000 *     7.828) + =      30.248

Total of 2 main streams to confluence:
Flow rates before confluence point:
      26.546       8.828
Maximum flow rates at confluence using above data:
       31.620       30.248
Area of streams before confluence:
       12.703        3.520
Effective area values after confluence:
       16.223       11.999


Results of confluence:
Total flow rate =     31.620(CFS)
Time of concentration =    13.792 min.
Effective stream area after confluence  =     16.223(Ac.)
Study area average Pervious fraction(Ap) =  0.225
Study area average soil loss rate(Fm) =    0.220(In/Hr)
Study area total =      16.22(Ac.)


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Process from Point/Station      216.000 to Point/Station      219.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1016.500(Ft.)
Downstream point elevation =  1016.100(Ft.)
Channel length thru subarea  =   251.000(Ft.)
Channel base width     =   10.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.025
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     31.620(CFS)
Depth of flow =   1.103(Ft.), Average velocity =   2.154(Ft/s)
Channel flow top width =   16.618(Ft.)
Flow Velocity =    2.15(Ft/s)
Travel time  =    1.94 min.
Time of concentration =   15.73 min.
Critical depth =      0.633(Ft.)


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Process from Point/Station      216.000 to Point/Station      219.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     16.223(Ac.)
Runoff from this stream =     31.620(CFS)
Time of concentration =   15.73 min.
Rainfall intensity =     1.833(In/Hr)
Area averaged loss rate (Fm) =    0.2203(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2253
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Program is now starting with Main Stream No. 2


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Process from Point/Station      217.000 to Point/Station      218.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   517.000(Ft.)
Top (of initial area) elevation =  1027.800(Ft.)
Bottom (of initial area) elevation =  1021.800(Ft.)
Difference in elevation =     6.000(Ft.)
Slope =    0.01161  s(%)=       1.16
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.023 min.
Rainfall intensity =      2.559(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.866
Subarea runoff =      7.641(CFS)
Total initial stream area =        3.450(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station      218.000 to Point/Station      219.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1021.800(Ft.)
Downstream point/station elevation =  1016.100(Ft.)
Pipe length  =   159.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.641(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     7.641(CFS)
Normal flow depth in pipe =    8.59(In.)
Flow top width inside pipe =   14.84(In.)
Critical Depth =   13.16(In.)
Pipe flow velocity =     10.52(Ft/s)
Travel time through pipe =    0.25 min.
Time of concentration (TC) =     9.27 min.


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Process from Point/Station      218.000 to Point/Station      219.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      3.450(Ac.)
Runoff from this stream =      7.641(CFS)
Time of concentration =    9.27 min.
Rainfall intensity =     2.517(In/Hr)
Area averaged loss rate (Fm) =    0.0978(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     31.62    16.223     15.73    0.220      1.833
2      7.64     3.450      9.27    0.098      2.517
Qmax(1) =
          1.000 *    1.000 *    31.620) +
          0.717 *    1.000 *     7.641) + =      37.101
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Qmax(2) =
          1.424 *    0.589 *    31.620) +
          1.000 *    1.000 *     7.641) + =      34.186

Total of 2 main streams to confluence:
Flow rates before confluence point:
      32.620       8.641
Maximum flow rates at confluence using above data:
       37.101       34.186
Area of streams before confluence:
       16.223        3.450
Effective area values after confluence:
       19.673       13.013


Results of confluence:
Total flow rate =     37.101(CFS)
Time of concentration =    15.734 min.
Effective stream area after confluence  =     19.673(Ac.)
Study area average Pervious fraction(Ap) =  0.203
Study area average soil loss rate(Fm) =    0.199(In/Hr)
Study area total =      19.67(Ac.)


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Process from Point/Station      219.000 to Point/Station      222.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1016.100(Ft.)
Downstream point elevation =  1016.000(Ft.)
Channel length thru subarea  =   259.000(Ft.)
Channel base width     =   10.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.015
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =     37.101(CFS)
Depth of flow =   1.342(Ft.), Average velocity =   1.970(Ft/s)
Channel flow top width =   18.054(Ft.)
Flow Velocity =    1.97(Ft/s)
Travel time  =    2.19 min.
Time of concentration =   17.93 min.
Critical depth =      0.703(Ft.)


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Process from Point/Station      219.000 to Point/Station      222.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     19.673(Ac.)
Runoff from this stream =     37.101(CFS)
Time of concentration =   17.93 min.
Rainfall intensity =     1.695(In/Hr)
Area averaged loss rate (Fm) =    0.1988(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2033
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      220.000 to Point/Station      221.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
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```
Initial subarea data:
Initial area flow distance =   517.000(Ft.)
Top (of initial area) elevation =  1026.800(Ft.)
Bottom (of initial area) elevation =  1020.700(Ft.)
Difference in elevation =     6.100(Ft.)
Slope =    0.01180  s(%)=       1.18
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.993 min.
Rainfall intensity =      2.564(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.866
Subarea runoff =      7.657(CFS)
Total initial stream area =        3.450(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      221.000 to Point/Station      222.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1020.700(Ft.)
Downstream point/station elevation =  1016.000(Ft.)
Pipe length  =   144.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.657(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     7.657(CFS)
Normal flow depth in pipe =    8.86(In.)
Flow top width inside pipe =   14.75(In.)
Critical Depth =   13.17(In.)
Pipe flow velocity =     10.14(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =     9.23 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      221.000 to Point/Station      222.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      3.450(Ac.)
Runoff from this stream =      7.657(CFS)
Time of concentration =    9.23 min.
Rainfall intensity =     2.524(In/Hr)
Area averaged loss rate (Fm) =    0.0978(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     37.10    19.673     17.93    0.199      1.695
2      7.66     3.450      9.23    0.098      2.524
Qmax(1) =
          1.000 *    1.000 *    37.101) +
          0.658 *    1.000 *     7.657) + =      42.141
Qmax(2) =
          1.554 *    0.515 *    37.101) +
          1.000 *    1.000 *     7.657) + =      37.349

Total of 2 main streams to confluence:
Flow rates before confluence point:
      38.101       8.657
Maximum flow rates at confluence using above data:
       42.141       37.349
Area of streams before confluence:
       19.673        3.450
Effective area values after confluence:
       23.123       13.580
```

```
Results of confluence:
Total flow rate =     42.141(CFS)
Time of concentration =    17.925 min.
Effective stream area after confluence  =     23.123(Ac.)
Study area average Pervious fraction(Ap) =  0.188
Study area average soil loss rate(Fm) =    0.184(In/Hr)
Study area total =      23.12(Ac.)


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Process from Point/Station      222.000 to Point/Station      222.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
PARK subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =     32.359(CFS)
therefore the upstream flow rate of Q =     42.141(CFS) is being used
Time of concentration =    17.93 min.
Rainfall intensity =      1.695(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.786
Subarea runoff =      0.000(CFS) for    1.170(Ac.)
Total runoff =     42.141(CFS)
Effective area this stream =       24.29(Ac.)
Total Study Area (Main Stream No. 1) =       25.04(Ac.)
Area averaged Fm value =    0.215(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      222.000 to Point/Station      226.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1016.000(Ft.)
Downstream point/station elevation =  1014.500(Ft.)
Pipe length  =   501.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    42.141(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =    42.141(CFS)
Normal flow depth in pipe =   29.81(In.)
Flow top width inside pipe =   33.10(In.)
Critical Depth =   24.80(In.)
Pipe flow velocity =      6.19(Ft/s)
Travel time through pipe =    1.35 min.
Time of concentration (TC) =    19.27 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      222.000 to Point/Station      226.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     24.293(Ac.)
Runoff from this stream =     42.141(CFS)
Time of concentration =   19.27 min.
Rainfall intensity =     1.623(In/Hr)
Area averaged loss rate (Fm) =    0.2149(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2198
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      223.000 to Point/Station      224.000
**** INITIAL AREA EVALUATION ****
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```
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   559.000(Ft.)
Top (of initial area) elevation =  1025.600(Ft.)
Bottom (of initial area) elevation =  1019.400(Ft.)
Difference in elevation =     6.200(Ft.)
Slope =    0.01109  s(%)=       1.11
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.394 min.
Rainfall intensity =      2.498(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.865
Subarea runoff =     10.691(CFS)
Total initial stream area =        4.950(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station      224.000 to Point/Station      225.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1019.400(Ft.)
Downstream point/station elevation =  1014.700(Ft.)
Pipe length  =    87.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.691(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    10.691(CFS)
Normal flow depth in pipe =    9.35(In.)
Flow top width inside pipe =   14.54(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.28(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =     9.50 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      225.000 to Point/Station      225.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
PARK subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.8500     Max loss rate(Fm)=     0.831(In/Hr)
Time of concentration =     9.50 min.
Rainfall intensity =      2.480(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.831
Subarea runoff =      0.992(CFS) for    0.720(Ac.)
Total runoff =     11.683(CFS)
Effective area this stream =        5.67(Ac.)
Total Study Area (Main Stream No. 2) =       30.71(Ac.)
Area averaged Fm value =    0.191(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      225.000 to Point/Station      226.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1014.700(Ft.)
Downstream point/station elevation =  1014.500(Ft.)
Pipe length  =   122.00(Ft.)   Manning's N = 0.013
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No. of pipes = 1  Required pipe flow  =    11.683(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    11.683(CFS)
Normal flow depth in pipe =   20.63(In.)
Flow top width inside pipe =   22.93(In.)
Critical Depth =   14.20(In.)
Pipe flow velocity =      3.58(Ft/s)
Travel time through pipe =    0.57 min.
Time of concentration (TC) =    10.07 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      225.000 to Point/Station      226.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      5.670(Ac.)
Runoff from this stream =     11.683(CFS)
Time of concentration =   10.07 min.
Rainfall intensity =     2.396(In/Hr)
Area averaged loss rate (Fm) =    0.1909(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1952
Summary of stream data:

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


1     42.14    24.293     19.27    0.215      1.623
2     11.68     5.670     10.07    0.191      2.396
Qmax(1) =
          1.000 *    1.000 *    42.141) +
          0.649 *    1.000 *    11.683) + =      49.729
Qmax(2) =
          1.549 *    0.522 *    42.141) +
          1.000 *    1.000 *    11.683) + =      45.788

Total of 2 main streams to confluence:
Flow rates before confluence point:
      43.141      12.683
Maximum flow rates at confluence using above data:
       49.729       45.788
Area of streams before confluence:
       24.293        5.670
Effective area values after confluence:
       29.963       18.363


Results of confluence:
Total flow rate =     49.729(CFS)
Time of concentration =    19.275 min.
Effective stream area after confluence  =     29.963(Ac.)
Study area average Pervious fraction(Ap) =  0.215
Study area average soil loss rate(Fm) =    0.210(In/Hr)
Study area total =      29.96(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      226.000 to Point/Station      227.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1014.500(Ft.)
Downstream point/station elevation =  1014.000(Ft.)
Pipe length  =   410.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    49.729(CFS)
Nearest computed pipe diameter  =     48.00(In.)
Calculated individual pipe flow  =    49.729(CFS)
Normal flow depth in pipe =   39.00(In.)
Flow top width inside pipe =   37.47(In.)
Critical Depth =   25.39(In.)
```

```
Pipe flow velocity =      4.55(Ft/s)
Travel time through pipe =    1.50 min.
Time of concentration (TC) =    20.78 min.
End of computations, Total Study Area =           30.71 (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) = 0.216
Area averaged SCS curve number =  32.0
```

APPENDIX B.2: RATIONAL METHOD ANALYSIS, AREAS "C" AND "D"

100-YEAR

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2014 Version 9.0
Rational Hydrology Study Date: 07/12/18

257.02.17 BLOOMINGTON
100-YEAR RATIONAL TABLING METHOD
POST-PROJECT CONDITION FOR AREAS "C" & "D"
FN: ARCD100.RSB

Program License Serial Number 6279

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.300 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

++

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

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)
Initial subarea data:
Initial area flow distance = 323.000(Ft.)
Top (of initial area) elevation = 1024.400(Ft.)
Bottom (of initial area) elevation = 1015.400(Ft.)
Difference in elevation = 9.000(Ft.)
Slope = 0.02786 s(%)= 2.79
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 6.274 min.
Rainfall intensity = 5.039(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.883
Subarea runoff = 4.135(CFS)
Total initial stream area = 0.930(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.098(In/Hr)

++

Process from Point/Station 402.000 to Point/Station 403.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1015.400(Ft.)
Downstream point/station elevation = 1010.000(Ft.)
Pipe length = 50.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.135(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 4.135(CFS)
Normal flow depth in pipe = 5.87(In.)
Flow top width inside pipe = 8.57(In.)
Critical depth could not be calculated.
Pipe flow velocity = 13.54(Ft/s)
Travel time through pipe = 0.06 min.
Time of concentration (TC) = 6.34 min.

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Process from Point/Station      403.000 to Point/Station      405.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =  1010.100(Ft.)
Downstream point elevation =  1010.000(Ft.)
Channel length thru subarea  =   360.000(Ft.)
Channel base width     =   11.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =      4.179(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      4.179(CFS)
Depth of flow =   0.598(Ft.), Average velocity =   0.522(Ft/s)
Channel flow top width =   15.783(Ft.)
Flow Velocity =    0.52(Ft/s)
Travel time  =   11.50 min.
Time of concentration =   17.83 min.
Critical depth =      0.162(Ft.)
 Adding area flow to channel
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =      2.895(CFS)
therefore the upstream flow rate of Q =      4.135(CFS) is being used
Rainfall intensity =      2.692(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.867
Subarea runoff =      0.000(CFS) for    0.310(Ac.)
Total runoff =      4.135(CFS)
Effective area this stream =        1.24(Ac.)
Total Study Area (Main Stream No. 1) =        1.24(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Depth of flow =   0.594(Ft.), Average velocity =   0.520(Ft/s)
Critical depth =      0.160(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      403.000 to Point/Station      405.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.240(Ac.)
Runoff from this stream =      4.135(CFS)
Time of concentration =   17.83 min.
Rainfall intensity =     2.692(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


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Process from Point/Station      404.000 to Point/Station      405.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   438.000(Ft.)
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```
Top (of initial area) elevation =  1024.400(Ft.)
Bottom (of initial area) elevation =  1012.900(Ft.)
Difference in elevation =    11.500(Ft.)
Slope =    0.02626  s(%)=       2.63
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.172 min.
Rainfall intensity =      4.650(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.881
Subarea runoff =     11.431(CFS)
Total initial stream area =        2.790(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station      404.000 to Point/Station      405.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.790(Ac.)
Runoff from this stream =     11.431(CFS)
Time of concentration =    7.17 min.
Rainfall intensity =     4.650(In/Hr)
Area averaged loss rate (Fm) =    0.0978(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      4.14     1.240     17.83    0.098      2.692
2     11.43     2.790      7.17    0.098      4.650
Qmax(1) =
          1.000 *    1.000 *     4.135) +
          0.570 *    1.000 *    11.431) + =      10.650
Qmax(2) =
          1.755 *    0.402 *     4.135) +
          1.000 *    1.000 *    11.431) + =      14.349

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.135      11.431
Maximum flow rates at confluence using above data:
       10.650       14.349
Area of streams before confluence:
        1.240        2.790
Effective area values after confluence:
        4.030        3.289
Results of confluence:
Total flow rate =     14.349(CFS)
Time of concentration =     7.172 min.
Effective stream area after confluence =      3.289(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.098(In/Hr)
Study area total (this main stream) =       4.03(Ac.)


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Process from Point/Station      405.000 to Point/Station      408.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1010.000(Ft.)
Downstream point/station elevation =  1007.000(Ft.)
Pipe length  =   113.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.349(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    14.349(CFS)
Normal flow depth in pipe =   12.61(In.)
Flow top width inside pipe =   16.49(In.)
Critical Depth =   16.69(In.)
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Pipe flow velocity =     10.85(Ft/s)
Travel time through pipe =    0.17 min.
Time of concentration (TC) =     7.35 min.


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Process from Point/Station      405.000 to Point/Station      408.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.289(Ac.)
Runoff from this stream =     14.349(CFS)
Time of concentration =    7.35 min.
Rainfall intensity =     4.584(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      406.000 to Point/Station      407.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   642.000(Ft.)
Top (of initial area) elevation =  1024.600(Ft.)
Bottom (of initial area) elevation =  1011.000(Ft.)
Difference in elevation =    13.600(Ft.)
Slope =    0.02118  s(%)=       2.12
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.723 min.
Rainfall intensity =      4.134(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.879
Subarea runoff =      9.373(CFS)
Total initial stream area =        2.580(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      406.000 to Point/Station      407.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =     8.72 min.
Rainfall intensity =      4.134(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 =      1.017(CFS) for    0.280(Ac.)
Total runoff =     10.390(CFS)
Effective area this stream =        2.86(Ac.)
Total Study Area (Main Stream No. 1) =        6.89(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station      407.000 to Point/Station      408.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
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Upstream point/station elevation =  1011.000(Ft.)
Downstream point/station elevation =  1007.000(Ft.)
Pipe length  =    50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.390(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    10.390(CFS)
Normal flow depth in pipe =    8.10(In.)
Flow top width inside pipe =   14.95(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.36(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =     8.78 min.


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Process from Point/Station      407.000 to Point/Station      408.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.860(Ac.)
Runoff from this stream =     10.390(CFS)
Time of concentration =    8.78 min.
Rainfall intensity =     4.119(In/Hr)
Area averaged loss rate (Fm) =    0.0978(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     14.35     3.289      7.35    0.098      4.584
2     10.39     2.860      8.78    0.098      4.119
Qmax(1) =
          1.000 *    1.000 *    14.349) +
          1.116 *    0.837 *    10.390) + =      24.049
Qmax(2) =
          0.896 *    1.000 *    14.349) +
          1.000 *    1.000 *    10.390) + =      23.253

Total of 2 streams to confluence:
Flow rates before confluence point:
      14.349      10.390
Maximum flow rates at confluence using above data:
       24.049       23.253
Area of streams before confluence:
        3.289        2.860
Effective area values after confluence:
        5.682        6.149
Results of confluence:
Total flow rate =     24.049(CFS)
Time of concentration =     7.345 min.
Effective stream area after confluence =      5.682(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.098(In/Hr)
Study area total (this main stream) =       6.15(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      408.000 to Point/Station      409.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1007.000(Ft.)
Downstream point/station elevation =  1005.000(Ft.)
Pipe length  =    16.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    24.049(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    24.049(CFS)
Normal flow depth in pipe =   10.55(In.)
Flow top width inside pipe =   17.73(In.)
Critical depth could not be calculated.
```

```
Pipe flow velocity =     22.36(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =     7.36 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      408.000 to Point/Station      409.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      5.682(Ac.)
Runoff from this stream =     24.049(CFS)
Time of concentration =    7.36 min.
Rainfall intensity =     4.579(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   635.000(Ft.)
Top (of initial area) elevation =  1035.000(Ft.)
Bottom (of initial area) elevation =  1023.000(Ft.)
Difference in elevation =    12.000(Ft.)
Slope =    0.01890  s(%)=       1.89
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.886 min.
Rainfall intensity =      4.089(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.878
Subarea runoff =     16.919(CFS)
Total initial stream area =        4.710(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      303.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =  1023.000(Ft.)
Downstream point elevation =  1021.000(Ft.)
Channel length thru subarea  =   500.000(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 =     26.630(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    4.000(Ft.)
Flow(q) thru subarea =     26.630(CFS)
Depth of flow =   1.203(Ft.), Average velocity =   5.025(Ft/s)
Channel flow top width =    6.812(Ft.)
Flow Velocity =    5.02(Ft/s)
Travel time  =    1.66 min.
Time of concentration =   10.54 min.
Critical depth =      1.203(Ft.)
 Adding area flow to channel
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
```

```
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Rainfall intensity =      3.690(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 =     19.355(CFS) for    6.510(Ac.)
Total runoff =     36.274(CFS)
Effective area this stream =       11.22(Ac.)
Total Study Area (Main Stream No. 2) =       18.11(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Depth of flow =   1.393(Ft.), Average velocity =   5.444(Ft/s)
Critical depth =      1.406(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      304.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1021.000(Ft.)
Downstream point elevation =  1018.000(Ft.)
Channel length thru subarea  =   600.000(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 =     46.406(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    4.000(Ft.)
Flow(q) thru subarea =     46.406(CFS)
Depth of flow =   1.483(Ft.), Average velocity =   6.301(Ft/s)
Channel flow top width =    7.932(Ft.)
Flow Velocity =    6.30(Ft/s)
Travel time  =    1.59 min.
Time of concentration =   12.13 min.
Critical depth =      1.594(Ft.)
 Adding area flow to channel
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Rainfall intensity =      3.392(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 =     20.180(CFS) for    7.820(Ac.)
Total runoff =     56.454(CFS)
Effective area this stream =       19.04(Ac.)
Total Study Area (Main Stream No. 2) =       25.93(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Depth of flow =   1.624(Ft.), Average velocity =   6.626(Ft/s)
Critical depth =      1.750(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      304.000 to Point/Station      409.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1018.000(Ft.)
Downstream point/station elevation =  1005.000(Ft.)
Pipe length  =   186.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    56.454(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    56.454(CFS)
Normal flow depth in pipe =   18.56(In.)
Flow top width inside pipe =   20.09(In.)
Critical depth could not be calculated.
Pipe flow velocity =     21.65(Ft/s)
Travel time through pipe =    0.14 min.
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Time of concentration (TC) =    12.27 min.


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Process from Point/Station      304.000 to Point/Station      409.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     19.040(Ac.)
Runoff from this stream =     56.454(CFS)
Time of concentration =   12.27 min.
Rainfall intensity =     3.368(In/Hr)
Area averaged loss rate (Fm) =    0.0978(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     24.05     5.682      7.36    0.098      4.579
2     56.45    19.040     12.27    0.098      3.368
Qmax(1) =
          1.000 *    1.000 *    24.049) +
          1.370 *    0.599 *    56.454) + =      70.415
Qmax(2) =
          0.730 *    1.000 *    24.049) +
          1.000 *    1.000 *    56.454) + =      74.005

Total of 2 main streams to confluence:
Flow rates before confluence point:
      25.049      57.454
Maximum flow rates at confluence using above data:
       70.415       74.005
Area of streams before confluence:
        5.682       19.040
Effective area values after confluence:
       17.094       24.722


Results of confluence:
Total flow rate =     74.005(CFS)
Time of concentration =    12.275 min.
Effective stream area after confluence  =     24.722(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.098(In/Hr)
Study area total =      24.72(Ac.)
End of computations, Total Study Area =           25.93 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

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

10-YEAR

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2014 Version 9.0
Rational Hydrology Study Date: 07/12/18

257.02.17 BLOOMINGTON
10-YEAR RATIONAL TABLING METHOD
POST-PROJECT CONDITION FOR AREAS "C" & "D"
FN: ARCD10.RSB

Program License Serial Number 6279

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

Rational hydrology study storm event year is 10.0
Computed rainfall intensity:
Storm year = 10.00 1 hour rainfall = 0.821 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

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

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)
Initial subarea data:
Initial area flow distance = 323.000(Ft.)
Top (of initial area) elevation = 1024.400(Ft.)
Bottom (of initial area) elevation = 1015.400(Ft.)
Difference in elevation = 9.000(Ft.)
Slope = 0.02786 s(%)= 2.79
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 6.274 min.
Rainfall intensity = 3.182(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.872
Subarea runoff = 2.582(CFS)
Total initial stream area = 0.930(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.098(In/Hr)

++

Process from Point/Station 402.000 to Point/Station 403.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1015.400(Ft.)
Downstream point/station elevation = 1010.000(Ft.)
Pipe length = 50.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.582(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 2.582(CFS)
Normal flow depth in pipe = 4.37(In.)
Flow top width inside pipe = 9.00(In.)
Critical Depth = 8.37(In.)
Pipe flow velocity = 12.15(Ft/s)
Travel time through pipe = 0.07 min.
Time of concentration (TC) = 6.34 min.

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      403.000 to Point/Station      405.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1010.100(Ft.)
Downstream point elevation =  1010.000(Ft.)
Channel length thru subarea  =   360.000(Ft.)
Channel base width     =   11.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =      2.608(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      2.608(CFS)
Depth of flow =   0.456(Ft.), Average velocity =   0.446(Ft/s)
Channel flow top width =   14.651(Ft.)
Flow Velocity =    0.45(Ft/s)
Travel time  =   13.47 min.
Time of concentration =   19.81 min.
Critical depth =      0.119(Ft.)
 Adding area flow to channel
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =      1.672(CFS)
therefore the upstream flow rate of Q =      2.582(CFS) is being used
Rainfall intensity =      1.596(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.845
Subarea runoff =      0.000(CFS) for    0.310(Ac.)
Total runoff =      2.582(CFS)
Effective area this stream =        1.24(Ac.)
Total Study Area (Main Stream No. 1) =        1.24(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Depth of flow =   0.454(Ft.), Average velocity =   0.444(Ft/s)
Critical depth =      0.117(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      403.000 to Point/Station      405.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.240(Ac.)
Runoff from this stream =      2.582(CFS)
Time of concentration =   19.81 min.
Rainfall intensity =     1.596(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      404.000 to Point/Station      405.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   438.000(Ft.)
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```
Top (of initial area) elevation =  1024.400(Ft.)
Bottom (of initial area) elevation =  1012.900(Ft.)
Difference in elevation =    11.500(Ft.)
Slope =    0.02626  s(%)=       2.63
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.172 min.
Rainfall intensity =      2.937(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff =      7.129(CFS)
Total initial stream area =        2.790(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      404.000 to Point/Station      405.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.790(Ac.)
Runoff from this stream =      7.129(CFS)
Time of concentration =    7.17 min.
Rainfall intensity =     2.937(In/Hr)
Area averaged loss rate (Fm) =    0.0978(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      2.58     1.240     19.81    0.098      1.596
2      7.13     2.790      7.17    0.098      2.937
Qmax(1) =
          1.000 *    1.000 *     2.582) +
          0.528 *    1.000 *     7.129) + =       6.344
Qmax(2) =
          1.894 *    0.362 *     2.582) +
          1.000 *    1.000 *     7.129) + =       8.899

Total of 2 streams to confluence:
Flow rates before confluence point:
       2.582       7.129
Maximum flow rates at confluence using above data:
        6.344        8.899
Area of streams before confluence:
        1.240        2.790
Effective area values after confluence:
        4.030        3.239
Results of confluence:
Total flow rate =      8.899(CFS)
Time of concentration =     7.172 min.
Effective stream area after confluence =      3.239(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.098(In/Hr)
Study area total (this main stream) =       4.03(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      405.000 to Point/Station      408.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1010.000(Ft.)
Downstream point/station elevation =  1007.000(Ft.)
Pipe length  =   113.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.899(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     8.899(CFS)
Normal flow depth in pipe =   10.58(In.)
Flow top width inside pipe =   13.67(In.)
Critical Depth =   13.82(In.)
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Pipe flow velocity =      9.62(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =     7.37 min.


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Process from Point/Station      405.000 to Point/Station      408.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.239(Ac.)
Runoff from this stream =      8.899(CFS)
Time of concentration =    7.37 min.
Rainfall intensity =     2.890(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      406.000 to Point/Station      407.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   642.000(Ft.)
Top (of initial area) elevation =  1024.600(Ft.)
Bottom (of initial area) elevation =  1011.000(Ft.)
Difference in elevation =    13.600(Ft.)
Slope =    0.02118  s(%)=       2.12
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.723 min.
Rainfall intensity =      2.611(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.866
Subarea runoff =      5.836(CFS)
Total initial stream area =        2.580(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      406.000 to Point/Station      407.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =     8.72 min.
Rainfall intensity =      2.611(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 =      0.633(CFS) for    0.280(Ac.)
Total runoff =      6.469(CFS)
Effective area this stream =        2.86(Ac.)
Total Study Area (Main Stream No. 1) =        6.89(Ac.)
Area averaged Fm value =    0.098(In/Hr)


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Process from Point/Station      407.000 to Point/Station      408.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
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Upstream point/station elevation =  1011.000(Ft.)
Downstream point/station elevation =  1007.000(Ft.)
Pipe length  =    50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.469(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     6.469(CFS)
Normal flow depth in pipe =    6.99(In.)
Flow top width inside pipe =   11.84(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.62(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     8.78 min.


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Process from Point/Station      407.000 to Point/Station      408.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.860(Ac.)
Runoff from this stream =      6.469(CFS)
Time of concentration =    8.78 min.
Rainfall intensity =     2.600(In/Hr)
Area averaged loss rate (Fm) =    0.0978(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      8.90     3.239      7.37    0.098      2.890
2      6.47     2.860      8.78    0.098      2.600
Qmax(1) =
          1.000 *    1.000 *     8.899) +
          1.116 *    0.839 *     6.469) + =      14.952
Qmax(2) =
          0.896 *    1.000 *     8.899) +
          1.000 *    1.000 *     6.469) + =      14.446

Total of 2 streams to confluence:
Flow rates before confluence point:
       8.899       6.469
Maximum flow rates at confluence using above data:
       14.952       14.446
Area of streams before confluence:
        3.239        2.860
Effective area values after confluence:
        5.638        6.099
Results of confluence:
Total flow rate =     14.952(CFS)
Time of concentration =     7.367 min.
Effective stream area after confluence =      5.638(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.098(In/Hr)
Study area total (this main stream) =       6.10(Ac.)


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Process from Point/Station      408.000 to Point/Station      409.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1007.000(Ft.)
Downstream point/station elevation =  1005.000(Ft.)
Pipe length  =    16.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.952(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    14.952(CFS)
Normal flow depth in pipe =    8.85(In.)
Flow top width inside pipe =   14.76(In.)
Critical depth could not be calculated.
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Pipe flow velocity =     19.84(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =     7.38 min.


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Process from Point/Station      408.000 to Point/Station      409.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      5.638(Ac.)
Runoff from this stream =     14.952(CFS)
Time of concentration =    7.38 min.
Rainfall intensity =     2.886(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   635.000(Ft.)
Top (of initial area) elevation =  1035.000(Ft.)
Bottom (of initial area) elevation =  1023.000(Ft.)
Difference in elevation =    12.000(Ft.)
Slope =    0.01890  s(%)=       1.89
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.886 min.
Rainfall intensity =      2.582(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.866
Subarea runoff =     10.532(CFS)
Total initial stream area =        4.710(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      303.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1023.000(Ft.)
Downstream point elevation =  1021.000(Ft.)
Channel length thru subarea  =   500.000(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 =     16.438(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    4.000(Ft.)
Flow(q) thru subarea =     16.438(CFS)
Depth of flow =   0.952(Ft.), Average velocity =   4.426(Ft/s)
Channel flow top width =    5.806(Ft.)
Flow Velocity =    4.43(Ft/s)
Travel time  =    1.88 min.
Time of concentration =   10.77 min.
Critical depth =      0.938(Ft.)
 Adding area flow to channel
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
```

```
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Rainfall intensity =      2.301(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 =     11.717(CFS) for    6.510(Ac.)
Total runoff =     22.249(CFS)
Effective area this stream =       11.22(Ac.)
Total Study Area (Main Stream No. 2) =       18.11(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Depth of flow =   1.103(Ft.), Average velocity =   4.794(Ft/s)
Critical depth =      1.094(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      304.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1021.000(Ft.)
Downstream point elevation =  1018.000(Ft.)
Channel length thru subarea  =   600.000(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 =     28.282(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    4.000(Ft.)
Flow(q) thru subarea =     28.282(CFS)
Depth of flow =   1.174(Ft.), Average velocity =   5.543(Ft/s)
Channel flow top width =    6.695(Ft.)
Flow Velocity =    5.54(Ft/s)
Travel time  =    1.80 min.
Time of concentration =   12.57 min.
Critical depth =      1.242(Ft.)
 Adding area flow to channel
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Rainfall intensity =      2.097(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.858
Subarea runoff =     12.008(CFS) for    7.820(Ac.)
Total runoff =     34.257(CFS)
Effective area this stream =       19.04(Ac.)
Total Study Area (Main Stream No. 2) =       25.93(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Depth of flow =   1.286(Ft.), Average velocity =   5.826(Ft/s)
Critical depth =      1.375(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      304.000 to Point/Station      409.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1018.000(Ft.)
Downstream point/station elevation =  1005.000(Ft.)
Pipe length  =   186.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    34.257(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    34.257(CFS)
Normal flow depth in pipe =   14.44(In.)
Flow top width inside pipe =   19.47(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.42(Ft/s)
Travel time through pipe =    0.16 min.
```

```
Time of concentration (TC) =    12.73 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      304.000 to Point/Station      409.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     19.040(Ac.)
Runoff from this stream =     34.257(CFS)
Time of concentration =   12.73 min.
Rainfall intensity =     2.081(In/Hr)
Area averaged loss rate (Fm) =    0.0978(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     14.95     5.638      7.38    0.098      2.886
2     34.26    19.040     12.73    0.098      2.081
Qmax(1) =
          1.000 *    1.000 *    14.952) +
          1.406 *    0.580 *    34.257) + =      42.875
Qmax(2) =
          0.711 *    1.000 *    14.952) +
          1.000 *    1.000 *    34.257) + =      44.891

Total of 2 main streams to confluence:
Flow rates before confluence point:
      15.952      35.257
Maximum flow rates at confluence using above data:
       42.875       44.891
Area of streams before confluence:
        5.638       19.040
Effective area values after confluence:
       16.675       24.678


Results of confluence:
Total flow rate =     44.891(CFS)
Time of concentration =    12.732 min.
Effective stream area after confluence  =     24.678(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.098(In/Hr)
Study area total =      24.68(Ac.)
End of computations, Total Study Area =           25.93 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

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

APPENDIX B.3: RATIONAL METHOD ANALYSIS, AREA "E"

100-YEAR

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2014 Version 9.0
Rational Hydrology Study Date: 07/12/18

257.02.17 BLOOMINGTON
100-YEAR RATIONAL TABLING METHOD
POST-PROJECT CONDITION FOR AREA "E"
FN: ARE100.RSB

Program License Serial Number 6279

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.300 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

++

Process from Point/Station 501.000 to Point/Station 502.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)
Initial subarea data:
Initial area flow distance = 663.000(Ft.)
Top (of initial area) elevation = 1026.000(Ft.)
Bottom (of initial area) elevation = 1012.000(Ft.)
Difference in elevation = 14.000(Ft.)
Slope = 0.02112 s(%)= 2.11
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.842 min.
Rainfall intensity = 4.101(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.879
Subarea runoff = 8.719(CFS)
Total initial stream area = 2.420(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.098(In/Hr)
End of computations, Total Study Area = 2.42 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

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

10-YEAR

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2014 Version 9.0
Rational Hydrology Study Date: 07/12/18

257.02.17 BLOOMINGTON
10-YEAR RATIONAL TABLING METHOD
POST-PROJECT CONDITION FOR AREA "E"
FN: ARE10.RSB

Program License Serial Number 6279

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.300 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

++

Process from Point/Station 501.000 to Point/Station 502.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)
Initial subarea data:
Initial area flow distance = 663.000(Ft.)
Top (of initial area) elevation = 1026.000(Ft.)
Bottom (of initial area) elevation = 1012.000(Ft.)
Difference in elevation = 14.000(Ft.)
Slope = 0.02112 s(%)= 2.11
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.842 min.
Rainfall intensity = 4.101(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.879
Subarea runoff = 8.719(CFS)
Total initial stream area = 2.420(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.098(In/Hr)
End of computations, Total Study Area = 2.42 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

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

APPENDIX B.4: RATIONAL METHOD ANALYSIS, AREA "F"

100-YEAR

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2014 Version 9.0
Rational Hydrology Study Date: 07/12/18

257.02.17 BLOOMINGTON
100-YEAR RATIONAL TABLING METHOD
POST-PROJECT CONDITION FOR AREA "F"
FN: ARF100.RSB

Program License Serial Number 6279

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.300 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

++

Process from Point/Station 601.000 to Point/Station 602.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)
Initial subarea data:
Initial area flow distance = 604.000(Ft.)
Top (of initial area) elevation = 1016.000(Ft.)
Bottom (of initial area) elevation = 1012.000(Ft.)
Difference in elevation = 4.000(Ft.)
Slope = 0.00662 s(%)= 0.66
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.742 min.
Rainfall intensity = 3.649(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.876
Subarea runoff = 4.187(CFS)
Total initial stream area = 1.310(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.098(In/Hr)
End of computations, Total Study Area = 1.31 (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) = 0.100
Area averaged SCS curve number = 32.0

10-YEAR

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2014 Version 9.0
Rational Hydrology Study Date: 07/12/18

257.02.17 BLOOMINGTON
10-YEAR RATIONAL TABLING METHOD
POST-PROJECT CONDITION FOR AREA "F"
FN: ARF10.RSB

Program License Serial Number 6279

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.300 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

++

Process from Point/Station 601.000 to Point/Station 602.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)
Initial subarea data:
Initial area flow distance = 604.000(Ft.)
Top (of initial area) elevation = 1016.000(Ft.)
Bottom (of initial area) elevation = 1012.000(Ft.)
Difference in elevation = 4.000(Ft.)
Slope = 0.00662 s(%)= 0.66
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.742 min.
Rainfall intensity = 3.649(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.876
Subarea runoff = 4.187(CFS)
Total initial stream area = 1.310(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.098(In/Hr)
End of computations, Total Study Area = 1.31 (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) = 0.100
Area averaged SCS curve number = 32.0

APPENDIX C: PRE-PROJECT CONDITION UNIT HYDROGRAPH HYDROLOGY

APPENDIX C.1: UNIT HYDROGRAPH ANALYSIS, AREA "AB"

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

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Study date 06/21/18

++

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

Program License Serial Number 6279

BLOOMINGTON COMMERCE CENTER EXISTING CONDITION ONSITE HYDROLOGY
UNIT HYDROGRAPH ANALYSIS, 100-YEAR STORM EVENT'
FILENAME: ARAB

Storm Event Year = 100

Antecedent Moisture Condition = 2

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 100		
30.71	1	1.30
Rainfall data for year 100		
30.71	6	3.09
Rainfall data for year 100		
30.71	24	5.66

++

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

SCS curve No.(AMCII)	SCS curve NO.(AMC 2)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
46.0	46.0	30.71	1.000	0.856	1.000	0.856

Area-averaged adjusted loss rate Fm (In/Hr) = 0.856

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

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC2)	S	Pervious Yield Fr
30.71	1.000	46.0	46.0	11.74	0.129

Area-averaged catchment yield fraction, Y = 0.129
Area-averaged low loss fraction, Yb = 0.871
User entry of time of concentration = 0.631 (hours)

++
Watershed area = 30.71(Ac.)

Catchment Lag time = 0.505 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 16.5003
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.856(In/Hr)
Average low loss rate fraction (Yb) = 0.871 (decimal)
VALLEY UNDEVELOPED S-Graph Selected
Computed peak 5-minute rainfall = 0.481(In)
Computed peak 30-minute rainfall = 0.985(In)
Specified peak 1-hour rainfall = 1.300(In)
Computed peak 3-hour rainfall = 2.211(In)
Specified peak 6-hour rainfall = 3.090(In)
Specified peak 24-hour rainfall = 5.660(In)

Rainfall depth area reduction factors:
Using a total area of 30.71(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999 Adjusted rainfall = 0.480(In)
30-minute factor = 0.999 Adjusted rainfall = 0.984(In)
1-hour factor = 0.999 Adjusted rainfall = 1.298(In)
3-hour factor = 1.000 Adjusted rainfall = 2.210(In)
6-hour factor = 1.000 Adjusted rainfall = 3.090(In)
24-hour factor = 1.000 Adjusted rainfall = 5.660(In)

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

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 371.40 (CFS))		
1	1.435	5.328
2	5.173	13.884
3	11.488	23.452
4	20.412	33.147
5	31.510	41.217
6	43.341	43.941
7	53.813	38.891
8	61.355	28.011
9	66.771	20.117
10	70.891	15.302
11	73.975	11.452
12	76.484	9.317
13	78.747	8.407
14	80.709	7.285
15	82.425	6.376
16	84.004	5.863
17	85.444	5.347
18	86.690	4.630
19	87.812	4.166
20	88.805	3.689
21	89.795	3.677
22	90.703	3.372
23	91.435	2.718
24	92.161	2.696
25	92.830	2.485
26	93.364	1.983
27	93.892	1.961
28	94.412	1.929
29	94.908	1.843
30	95.403	1.838
31	95.866	1.719
32	96.235	1.371
33	96.598	1.348
34	96.946	1.294
35	97.247	1.117
36	97.544	1.103
37	97.827	1.053
38	98.063	0.874

39	98.294	0.858
40	98.513	0.813
41	98.683	0.632
42	98.848	0.613
43	99.013	0.613
44	99.178	0.613
45	99.343	0.613
46	99.508	0.613
47	99.673	0.613
48	99.838	0.613
49	100.000	0.603

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.4804	0.4804
2	0.6340	0.1535
3	0.7456	0.1116
4	0.8365	0.0909
5	0.9146	0.0781
6	0.9838	0.0692
7	1.0464	0.0626
8	1.1038	0.0574
9	1.1570	0.0532
10	1.2068	0.0498
11	1.2537	0.0469
12	1.2981	0.0444
13	1.3494	0.0513
14	1.3988	0.0493
15	1.4463	0.0475
16	1.4922	0.0459
17	1.5367	0.0445
18	1.5798	0.0431
19	1.6217	0.0419
20	1.6625	0.0408
21	1.7023	0.0398
22	1.7411	0.0388
23	1.7790	0.0379
24	1.8160	0.0371
25	1.8523	0.0363
26	1.8878	0.0355
27	1.9227	0.0348
28	1.9568	0.0342
29	1.9904	0.0335
30	2.0233	0.0330
31	2.0557	0.0324
32	2.0876	0.0319
33	2.1189	0.0313
34	2.1498	0.0309
35	2.1802	0.0304
36	2.2101	0.0300
37	2.2396	0.0295
38	2.2686	0.0291
39	2.2973	0.0287
40	2.3256	0.0283
41	2.3535	0.0279
42	2.3811	0.0276
43	2.4083	0.0272
44	2.4352	0.0269
45	2.4618	0.0266
46	2.4881	0.0263
47	2.5141	0.0260
48	2.5398	0.0257
49	2.5653	0.0254
50	2.5904	0.0252
51	2.6154	0.0249
52	2.6400	0.0247
53	2.6644	0.0244
54	2.6886	0.0242
55	2.7126	0.0240
56	2.7363	0.0237
57	2.7598	0.0235

58	2.7831	0.0233
59	2.8062	0.0231
60	2.8291	0.0229
61	2.8518	0.0227
62	2.8743	0.0225
63	2.8966	0.0223
64	2.9187	0.0221
65	2.9407	0.0220
66	2.9625	0.0218
67	2.9841	0.0216
68	3.0055	0.0214
69	3.0268	0.0213
70	3.0479	0.0211
71	3.0689	0.0210
72	3.0897	0.0208
73	3.1084	0.0187
74	3.1269	0.0185
75	3.1453	0.0184
76	3.1635	0.0182
77	3.1816	0.0181
78	3.1996	0.0180
79	3.2174	0.0178
80	3.2352	0.0177
81	3.2528	0.0176
82	3.2702	0.0175
83	3.2876	0.0174
84	3.3048	0.0172
85	3.3219	0.0171
86	3.3390	0.0170
87	3.3559	0.0169
88	3.3726	0.0168
89	3.3893	0.0167
90	3.4059	0.0166
91	3.4224	0.0165
92	3.4387	0.0164
93	3.4550	0.0163
94	3.4712	0.0162
95	3.4873	0.0161
96	3.5032	0.0160
97	3.5191	0.0159
98	3.5349	0.0158
99	3.5506	0.0157
100	3.5662	0.0156
101	3.5818	0.0155
102	3.5972	0.0154
103	3.6126	0.0154
104	3.6278	0.0153
105	3.6430	0.0152
106	3.6581	0.0151
107	3.6732	0.0150
108	3.6881	0.0149
109	3.7030	0.0149
110	3.7178	0.0148
111	3.7325	0.0147
112	3.7472	0.0146
113	3.7617	0.0146
114	3.7762	0.0145
115	3.7907	0.0144
116	3.8050	0.0144
117	3.8193	0.0143
118	3.8335	0.0142
119	3.8477	0.0142
120	3.8618	0.0141
121	3.8758	0.0140
122	3.8897	0.0140
123	3.9036	0.0139
124	3.9174	0.0138
125	3.9312	0.0138
126	3.9449	0.0137
127	3.9585	0.0136
128	3.9721	0.0136

129	3.9856	0.0135
130	3.9991	0.0135
131	4.0125	0.0134
132	4.0259	0.0133
133	4.0391	0.0133
134	4.0524	0.0132
135	4.0656	0.0132
136	4.0787	0.0131
137	4.0917	0.0131
138	4.1048	0.0130
139	4.1177	0.0130
140	4.1306	0.0129
141	4.1435	0.0129
142	4.1563	0.0128
143	4.1690	0.0128
144	4.1818	0.0127
145	4.1944	0.0127
146	4.2070	0.0126
147	4.2196	0.0126
148	4.2321	0.0125
149	4.2445	0.0125
150	4.2570	0.0124
151	4.2693	0.0124
152	4.2816	0.0123
153	4.2939	0.0123
154	4.3062	0.0122
155	4.3183	0.0122
156	4.3305	0.0121
157	4.3426	0.0121
158	4.3546	0.0121
159	4.3667	0.0120
160	4.3786	0.0120
161	4.3906	0.0119
162	4.4024	0.0119
163	4.4143	0.0118
164	4.4261	0.0118
165	4.4379	0.0118
166	4.4496	0.0117
167	4.4613	0.0117
168	4.4729	0.0116
169	4.4845	0.0116
170	4.4961	0.0116
171	4.5076	0.0115
172	4.5191	0.0115
173	4.5306	0.0115
174	4.5420	0.0114
175	4.5533	0.0114
176	4.5647	0.0113
177	4.5760	0.0113
178	4.5873	0.0113
179	4.5985	0.0112
180	4.6097	0.0112
181	4.6209	0.0112
182	4.6320	0.0111
183	4.6431	0.0111
184	4.6542	0.0111
185	4.6652	0.0110
186	4.6762	0.0110
187	4.6871	0.0110
188	4.6981	0.0109
189	4.7090	0.0109
190	4.7198	0.0109
191	4.7307	0.0108
192	4.7415	0.0108
193	4.7522	0.0108
194	4.7630	0.0107
195	4.7737	0.0107
196	4.7843	0.0107
197	4.7950	0.0106
198	4.8056	0.0106
199	4.8162	0.0106

200	4.8267	0.0106
201	4.8372	0.0105
202	4.8477	0.0105
203	4.8582	0.0105
204	4.8686	0.0104
205	4.8790	0.0104
206	4.8894	0.0104
207	4.8998	0.0103
208	4.9101	0.0103
209	4.9204	0.0103
210	4.9307	0.0103
211	4.9409	0.0102
212	4.9511	0.0102
213	4.9613	0.0102
214	4.9714	0.0102
215	4.9816	0.0101
216	4.9917	0.0101
217	5.0018	0.0101
218	5.0118	0.0101
219	5.0218	0.0100
220	5.0318	0.0100
221	5.0418	0.0100
222	5.0518	0.0099
223	5.0617	0.0099
224	5.0716	0.0099
225	5.0815	0.0099
226	5.0913	0.0098
227	5.1011	0.0098
228	5.1109	0.0098
229	5.1207	0.0098
230	5.1305	0.0098
231	5.1402	0.0097
232	5.1499	0.0097
233	5.1596	0.0097
234	5.1692	0.0097
235	5.1789	0.0096
236	5.1885	0.0096
237	5.1981	0.0096
238	5.2076	0.0096
239	5.2172	0.0095
240	5.2267	0.0095
241	5.2362	0.0095
242	5.2457	0.0095
243	5.2551	0.0095
244	5.2645	0.0094
245	5.2740	0.0094
246	5.2833	0.0094
247	5.2927	0.0094
248	5.3021	0.0093
249	5.3114	0.0093
250	5.3207	0.0093
251	5.3300	0.0093
252	5.3392	0.0093
253	5.3485	0.0092
254	5.3577	0.0092
255	5.3669	0.0092
256	5.3761	0.0092
257	5.3852	0.0092
258	5.3944	0.0091
259	5.4035	0.0091
260	5.4126	0.0091
261	5.4217	0.0091
262	5.4307	0.0091
263	5.4398	0.0090
264	5.4488	0.0090
265	5.4578	0.0090
266	5.4668	0.0090
267	5.4757	0.0090
268	5.4847	0.0089
269	5.4936	0.0089
270	5.5025	0.0089

271	5.5114	0.0089
272	5.5203	0.0089
273	5.5291	0.0089
274	5.5380	0.0088
275	5.5468	0.0088
276	5.5556	0.0088
277	5.5644	0.0088
278	5.5731	0.0088
279	5.5819	0.0087
280	5.5906	0.0087
281	5.5993	0.0087
282	5.6080	0.0087
283	5.6167	0.0087
284	5.6253	0.0087
285	5.6340	0.0086
286	5.6426	0.0086
287	5.6512	0.0086
288	5.6598	0.0086

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0086	0.0075	0.0011
2	0.0086	0.0075	0.0011
3	0.0086	0.0075	0.0011
4	0.0087	0.0075	0.0011
5	0.0087	0.0076	0.0011
6	0.0087	0.0076	0.0011
7	0.0087	0.0076	0.0011
8	0.0088	0.0076	0.0011
9	0.0088	0.0077	0.0011
10	0.0088	0.0077	0.0011
11	0.0089	0.0077	0.0011
12	0.0089	0.0077	0.0011
13	0.0089	0.0078	0.0011
14	0.0089	0.0078	0.0011
15	0.0090	0.0078	0.0012
16	0.0090	0.0078	0.0012
17	0.0090	0.0079	0.0012
18	0.0090	0.0079	0.0012
19	0.0091	0.0079	0.0012
20	0.0091	0.0079	0.0012
21	0.0091	0.0080	0.0012
22	0.0092	0.0080	0.0012
23	0.0092	0.0080	0.0012
24	0.0092	0.0080	0.0012
25	0.0093	0.0081	0.0012
26	0.0093	0.0081	0.0012
27	0.0093	0.0081	0.0012
28	0.0093	0.0081	0.0012
29	0.0094	0.0082	0.0012
30	0.0094	0.0082	0.0012
31	0.0095	0.0082	0.0012
32	0.0095	0.0083	0.0012
33	0.0095	0.0083	0.0012
34	0.0095	0.0083	0.0012
35	0.0096	0.0084	0.0012
36	0.0096	0.0084	0.0012
37	0.0097	0.0084	0.0012
38	0.0097	0.0084	0.0012
39	0.0097	0.0085	0.0013
40	0.0098	0.0085	0.0013
41	0.0098	0.0085	0.0013
42	0.0098	0.0086	0.0013
43	0.0099	0.0086	0.0013
44	0.0099	0.0086	0.0013
45	0.0099	0.0087	0.0013
46	0.0100	0.0087	0.0013
47	0.0100	0.0087	0.0013
48	0.0101	0.0088	0.0013

49	0.0101	0.0088	0.0013
50	0.0101	0.0088	0.0013
51	0.0102	0.0089	0.0013
52	0.0102	0.0089	0.0013
53	0.0103	0.0089	0.0013
54	0.0103	0.0090	0.0013
55	0.0103	0.0090	0.0013
56	0.0104	0.0090	0.0013
57	0.0104	0.0091	0.0013
58	0.0105	0.0091	0.0013
59	0.0105	0.0092	0.0014
60	0.0106	0.0092	0.0014
61	0.0106	0.0092	0.0014
62	0.0106	0.0093	0.0014
63	0.0107	0.0093	0.0014
64	0.0107	0.0094	0.0014
65	0.0108	0.0094	0.0014
66	0.0108	0.0094	0.0014
67	0.0109	0.0095	0.0014
68	0.0109	0.0095	0.0014
69	0.0110	0.0096	0.0014
70	0.0110	0.0096	0.0014
71	0.0111	0.0097	0.0014
72	0.0111	0.0097	0.0014
73	0.0112	0.0098	0.0014
74	0.0112	0.0098	0.0014
75	0.0113	0.0099	0.0015
76	0.0113	0.0099	0.0015
77	0.0114	0.0099	0.0015
78	0.0115	0.0100	0.0015
79	0.0115	0.0100	0.0015
80	0.0116	0.0101	0.0015
81	0.0116	0.0101	0.0015
82	0.0117	0.0102	0.0015
83	0.0118	0.0102	0.0015
84	0.0118	0.0103	0.0015
85	0.0119	0.0104	0.0015
86	0.0119	0.0104	0.0015
87	0.0120	0.0105	0.0015
88	0.0121	0.0105	0.0016
89	0.0121	0.0106	0.0016
90	0.0122	0.0106	0.0016
91	0.0123	0.0107	0.0016
92	0.0123	0.0107	0.0016
93	0.0124	0.0108	0.0016
94	0.0125	0.0109	0.0016
95	0.0126	0.0109	0.0016
96	0.0126	0.0110	0.0016
97	0.0127	0.0111	0.0016
98	0.0128	0.0111	0.0016
99	0.0129	0.0112	0.0017
100	0.0129	0.0112	0.0017
101	0.0130	0.0113	0.0017
102	0.0131	0.0114	0.0017
103	0.0132	0.0115	0.0017
104	0.0132	0.0115	0.0017
105	0.0133	0.0116	0.0017
106	0.0134	0.0117	0.0017
107	0.0135	0.0118	0.0017
108	0.0136	0.0118	0.0017
109	0.0137	0.0119	0.0018
110	0.0138	0.0120	0.0018
111	0.0139	0.0121	0.0018
112	0.0140	0.0122	0.0018
113	0.0141	0.0123	0.0018
114	0.0142	0.0123	0.0018
115	0.0143	0.0124	0.0018
116	0.0144	0.0125	0.0018
117	0.0145	0.0126	0.0019
118	0.0146	0.0127	0.0019
119	0.0147	0.0128	0.0019

120	0.0148	0.0129	0.0019
121	0.0149	0.0130	0.0019
122	0.0150	0.0131	0.0019
123	0.0152	0.0132	0.0020
124	0.0153	0.0133	0.0020
125	0.0154	0.0135	0.0020
126	0.0155	0.0135	0.0020
127	0.0157	0.0137	0.0020
128	0.0158	0.0138	0.0020
129	0.0160	0.0139	0.0021
130	0.0161	0.0140	0.0021
131	0.0163	0.0142	0.0021
132	0.0164	0.0143	0.0021
133	0.0166	0.0144	0.0021
134	0.0167	0.0145	0.0021
135	0.0169	0.0147	0.0022
136	0.0170	0.0148	0.0022
137	0.0172	0.0150	0.0022
138	0.0174	0.0151	0.0022
139	0.0176	0.0153	0.0023
140	0.0177	0.0154	0.0023
141	0.0180	0.0157	0.0023
142	0.0181	0.0158	0.0023
143	0.0184	0.0160	0.0024
144	0.0185	0.0161	0.0024
145	0.0208	0.0181	0.0027
146	0.0210	0.0183	0.0027
147	0.0213	0.0185	0.0027
148	0.0214	0.0187	0.0028
149	0.0218	0.0190	0.0028
150	0.0220	0.0191	0.0028
151	0.0223	0.0194	0.0029
152	0.0225	0.0196	0.0029
153	0.0229	0.0199	0.0029
154	0.0231	0.0201	0.0030
155	0.0235	0.0205	0.0030
156	0.0237	0.0207	0.0031
157	0.0242	0.0211	0.0031
158	0.0244	0.0213	0.0031
159	0.0249	0.0217	0.0032
160	0.0252	0.0219	0.0032
161	0.0257	0.0224	0.0033
162	0.0260	0.0227	0.0033
163	0.0266	0.0232	0.0034
164	0.0269	0.0234	0.0035
165	0.0276	0.0240	0.0036
166	0.0279	0.0243	0.0036
167	0.0287	0.0250	0.0037
168	0.0291	0.0253	0.0037
169	0.0300	0.0261	0.0039
170	0.0304	0.0265	0.0039
171	0.0313	0.0273	0.0040
172	0.0319	0.0278	0.0041
173	0.0330	0.0287	0.0042
174	0.0335	0.0292	0.0043
175	0.0348	0.0303	0.0045
176	0.0355	0.0309	0.0046
177	0.0371	0.0323	0.0048
178	0.0379	0.0330	0.0049
179	0.0398	0.0346	0.0051
180	0.0408	0.0355	0.0053
181	0.0431	0.0376	0.0056
182	0.0445	0.0387	0.0057
183	0.0475	0.0414	0.0061
184	0.0493	0.0430	0.0064
185	0.0444	0.0387	0.0057
186	0.0469	0.0409	0.0060
187	0.0532	0.0464	0.0069
188	0.0574	0.0500	0.0074
189	0.0692	0.0603	0.0089
190	0.0781	0.0680	0.0101

191	0.1116	0.0713	0.0403
192	0.1535	0.0713	0.0822
193	0.4804	0.0713	0.4091
194	0.0909	0.0713	0.0196
195	0.0626	0.0545	0.0081
196	0.0498	0.0434	0.0064
197	0.0513	0.0447	0.0066
198	0.0459	0.0400	0.0059
199	0.0419	0.0365	0.0054
200	0.0388	0.0338	0.0050
201	0.0363	0.0316	0.0047
202	0.0342	0.0298	0.0044
203	0.0324	0.0282	0.0042
204	0.0309	0.0269	0.0040
205	0.0295	0.0257	0.0038
206	0.0283	0.0246	0.0036
207	0.0272	0.0237	0.0035
208	0.0263	0.0229	0.0034
209	0.0254	0.0222	0.0033
210	0.0247	0.0215	0.0032
211	0.0240	0.0209	0.0031
212	0.0233	0.0203	0.0030
213	0.0227	0.0198	0.0029
214	0.0221	0.0193	0.0029
215	0.0216	0.0188	0.0028
216	0.0211	0.0184	0.0027
217	0.0187	0.0163	0.0024
218	0.0182	0.0159	0.0023
219	0.0178	0.0155	0.0023
220	0.0175	0.0152	0.0023
221	0.0171	0.0149	0.0022
222	0.0168	0.0146	0.0022
223	0.0165	0.0144	0.0021
224	0.0162	0.0141	0.0021
225	0.0159	0.0138	0.0020
226	0.0156	0.0136	0.0020
227	0.0154	0.0134	0.0020
228	0.0151	0.0132	0.0019
229	0.0149	0.0130	0.0019
230	0.0146	0.0128	0.0019
231	0.0144	0.0126	0.0019
232	0.0142	0.0124	0.0018
233	0.0140	0.0122	0.0018
234	0.0138	0.0120	0.0018
235	0.0136	0.0119	0.0018
236	0.0135	0.0117	0.0017
237	0.0133	0.0116	0.0017
238	0.0131	0.0114	0.0017
239	0.0130	0.0113	0.0017
240	0.0128	0.0112	0.0016
241	0.0127	0.0110	0.0016
242	0.0125	0.0109	0.0016
243	0.0124	0.0108	0.0016
244	0.0122	0.0107	0.0016
245	0.0121	0.0105	0.0016
246	0.0120	0.0104	0.0015
247	0.0118	0.0103	0.0015
248	0.0117	0.0102	0.0015
249	0.0116	0.0101	0.0015
250	0.0115	0.0100	0.0015
251	0.0114	0.0099	0.0015
252	0.0113	0.0098	0.0015
253	0.0112	0.0097	0.0014
254	0.0111	0.0096	0.0014
255	0.0110	0.0095	0.0014
256	0.0109	0.0095	0.0014
257	0.0108	0.0094	0.0014
258	0.0107	0.0093	0.0014
259	0.0106	0.0092	0.0014
260	0.0105	0.0091	0.0014
261	0.0104	0.0091	0.0013

262	0.0103	0.0090	0.0013
263	0.0102	0.0089	0.0013
264	0.0102	0.0088	0.0013
265	0.0101	0.0088	0.0013
266	0.0100	0.0087	0.0013
267	0.0099	0.0086	0.0013
268	0.0098	0.0086	0.0013
269	0.0098	0.0085	0.0013
270	0.0097	0.0085	0.0012
271	0.0096	0.0084	0.0012
272	0.0096	0.0083	0.0012
273	0.0095	0.0083	0.0012
274	0.0094	0.0082	0.0012
275	0.0094	0.0082	0.0012
276	0.0093	0.0081	0.0012
277	0.0092	0.0081	0.0012
278	0.0092	0.0080	0.0012
279	0.0091	0.0079	0.0012
280	0.0091	0.0079	0.0012
281	0.0090	0.0078	0.0012
282	0.0089	0.0078	0.0012
283	0.0089	0.0077	0.0011
284	0.0088	0.0077	0.0011
285	0.0088	0.0076	0.0011
286	0.0087	0.0076	0.0011
287	0.0087	0.0076	0.0011
288	0.0086	0.0075	0.0011

Total soil rain loss = 4.49(In)
Total effective rainfall = 1.17(In)
Peak flow rate in flood hydrograph = 24.57(CFS)

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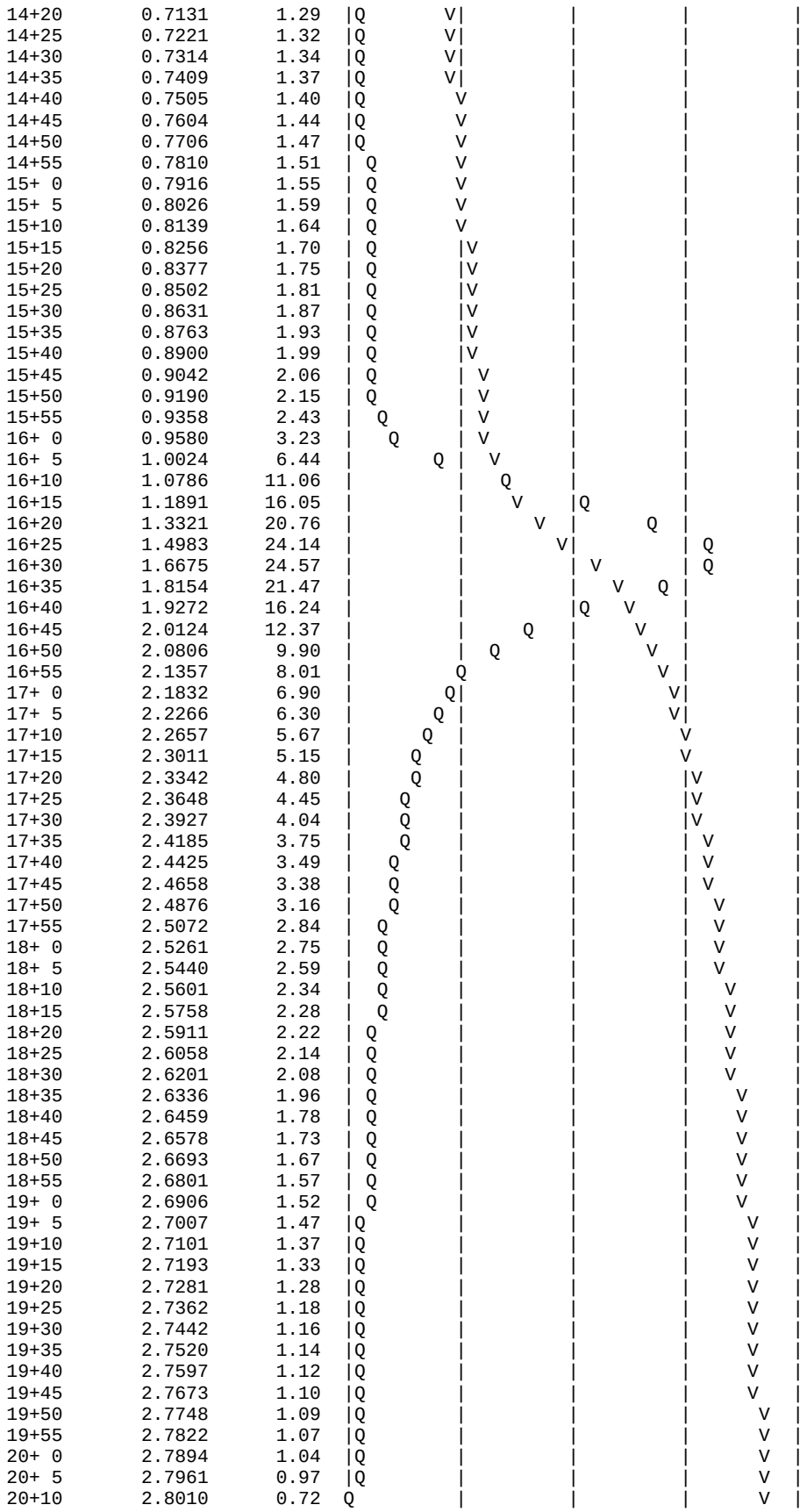
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	7.5	15.0	22.5	30.0
0+ 5	0.0000	0.01	Q	|	|	|	|
0+10	0.0002	0.02	Q	|	|	|	|
0+15	0.0005	0.05	Q	|	|	|	|
0+20	0.0011	0.08	Q	|	|	|	|
0+25	0.0020	0.13	Q	|	|	|	|
0+30	0.0032	0.18	Q	|	|	|	|
0+35	0.0047	0.22	Q	|	|	|	|
0+40	0.0065	0.25	Q	|	|	|	|
0+45	0.0084	0.28	Q	|	|	|	|
0+50	0.0104	0.29	Q	|	|	|	|
0+55	0.0126	0.31	Q	|	|	|	|
1+ 0	0.0148	0.32	Q	|	|	|	|
1+ 5	0.0170	0.33	Q	|	|	|	|
1+10	0.0194	0.34	Q	|	|	|	|
1+15	0.0218	0.35	Q	|	|	|	|
1+20	0.0242	0.35	Q	|	|	|	|
1+25	0.0267	0.36	Q	|	|	|	|
1+30	0.0292	0.37	Q	|	|	|	|
1+35	0.0318	0.37	Q	|	|	|	|
1+40	0.0344	0.38	Q	|	|	|	|
1+45	0.0370	0.38	Q	|	|	|	|
1+50	0.0397	0.39	Q	|	|	|	|
1+55	0.0424	0.39	Q	|	|	|	|
2+ 0	0.0452	0.40	Q	|	|	|	|
2+ 5	0.0479	0.40	Q	|	|	|	|
2+10	0.0507	0.40	Q	|	|	|	|
2+15	0.0535	0.41	Q	|	|	|	|
2+20	0.0564	0.41	Q	|	|	|	|
2+25	0.0592	0.42	Q	|	|	|	|

2+30	0.0621	0.42	Q	|	|	|	|
2+35	0.0650	0.42	Q	|	|	|	|
2+40	0.0679	0.42	Q	|	|	|	|
2+45	0.0709	0.43	Q	|	|	|	|
2+50	0.0739	0.43	Q	|	|	|	|
2+55	0.0768	0.43	QV	|	|	|	|
3+ 0	0.0798	0.44	QV	|	|	|	|
3+ 5	0.0829	0.44	QV	|	|	|	|
3+10	0.0859	0.44	QV	|	|	|	|
3+15	0.0890	0.44	QV	|	|	|	|
3+20	0.0920	0.45	QV	|	|	|	|
3+25	0.0951	0.45	QV	|	|	|	|
3+30	0.0982	0.45	QV	|	|	|	|
3+35	0.1013	0.45	QV	|	|	|	|
3+40	0.1045	0.46	QV	|	|	|	|
3+45	0.1076	0.46	QV	|	|	|	|
3+50	0.1108	0.46	QV	|	|	|	|
3+55	0.1140	0.46	QV	|	|	|	|
4+ 0	0.1172	0.46	QV	|	|	|	|
4+ 5	0.1204	0.47	QV	|	|	|	|
4+10	0.1236	0.47	QV	|	|	|	|
4+15	0.1269	0.47	QV	|	|	|	|
4+20	0.1301	0.47	QV	|	|	|	|
4+25	0.1334	0.47	QV	|	|	|	|
4+30	0.1367	0.48	QV	|	|	|	|
4+35	0.1400	0.48	QV	|	|	|	|
4+40	0.1433	0.48	QV	|	|	|	|
4+45	0.1466	0.48	QV	|	|	|	|
4+50	0.1499	0.48	QV	|	|	|	|
4+55	0.1532	0.49	Q V	|	|	|	|
5+ 0	0.1566	0.49	Q V	|	|	|	|
5+ 5	0.1600	0.49	Q V	|	|	|	|
5+10	0.1634	0.49	Q V	|	|	|	|
5+15	0.1668	0.49	Q V	|	|	|	|
5+20	0.1702	0.50	Q V	|	|	|	|
5+25	0.1736	0.50	Q V	|	|	|	|
5+30	0.1770	0.50	Q V	|	|	|	|
5+35	0.1805	0.50	Q V	|	|	|	|
5+40	0.1839	0.50	Q V	|	|	|	|
5+45	0.1874	0.51	Q V	|	|	|	|
5+50	0.1909	0.51	Q V	|	|	|	|
5+55	0.1944	0.51	Q V	|	|	|	|
6+ 0	0.1980	0.51	Q V	|	|	|	|
6+ 5	0.2015	0.51	Q V	|	|	|	|
6+10	0.2051	0.52	Q V	|	|	|	|
6+15	0.2086	0.52	Q V	|	|	|	|
6+20	0.2122	0.52	Q V	|	|	|	|
6+25	0.2158	0.52	Q V	|	|	|	|
6+30	0.2195	0.53	Q V	|	|	|	|
6+35	0.2231	0.53	Q V	|	|	|	|
6+40	0.2268	0.53	Q V	|	|	|	|
6+45	0.2304	0.53	Q V	|	|	|	|
6+50	0.2341	0.54	Q V	|	|	|	|
6+55	0.2378	0.54	Q V	|	|	|	|
7+ 0	0.2416	0.54	Q V	|	|	|	|
7+ 5	0.2453	0.54	Q V	|	|	|	|
7+10	0.2491	0.55	Q V	|	|	|	|
7+15	0.2529	0.55	Q V	|	|	|	|
7+20	0.2567	0.55	Q V	|	|	|	|
7+25	0.2605	0.55	Q V	|	|	|	|
7+30	0.2643	0.56	Q V	|	|	|	|
7+35	0.2682	0.56	Q V	|	|	|	|
7+40	0.2720	0.56	Q V	|	|	|	|
7+45	0.2759	0.57	Q V	|	|	|	|
7+50	0.2799	0.57	Q V	|	|	|	|
7+55	0.2838	0.57	Q V	|	|	|	|
8+ 0	0.2878	0.58	Q V	|	|	|	|
8+ 5	0.2917	0.58	Q V	|	|	|	|
8+10	0.2958	0.58	Q V	|	|	|	|
8+15	0.2998	0.58	Q V	|	|	|	|
8+20	0.3038	0.59	Q V	|	|	|	|

8+25	0.3079	0.59	Q	V	|	|	|	|
8+30	0.3120	0.59	Q	V	|	|	|	|
8+35	0.3161	0.60	Q	V	|	|	|	|
8+40	0.3203	0.60	Q	V	|	|	|	|
8+45	0.3244	0.60	Q	V	|	|	|	|
8+50	0.3286	0.61	Q	V	|	|	|	|
8+55	0.3328	0.61	Q	V	|	|	|	|
9+ 0	0.3371	0.62	Q	V	|	|	|	|
9+ 5	0.3413	0.62	Q	V	|	|	|	|
9+10	0.3456	0.62	Q	V	|	|	|	|
9+15	0.3499	0.63	Q	V	|	|	|	|
9+20	0.3543	0.63	Q	V	|	|	|	|
9+25	0.3587	0.64	Q	V	|	|	|	|
9+30	0.3631	0.64	Q	V	|	|	|	|
9+35	0.3675	0.64	Q	V	|	|	|	|
9+40	0.3720	0.65	Q	V	|	|	|	|
9+45	0.3765	0.65	Q	V	|	|	|	|
9+50	0.3810	0.66	Q	V	|	|	|	|
9+55	0.3855	0.66	Q	V	|	|	|	|
10+ 0	0.3901	0.67	Q	V	|	|	|	|
10+ 5	0.3947	0.67	Q	V	|	|	|	|
10+10	0.3994	0.68	Q	V	|	|	|	|
10+15	0.4041	0.68	Q	V	|	|	|	|
10+20	0.4088	0.69	Q	V	|	|	|	|
10+25	0.4135	0.69	Q	V	|	|	|	|
10+30	0.4183	0.70	Q	V	|	|	|	|
10+35	0.4232	0.70	Q	V	|	|	|	|
10+40	0.4280	0.71	Q	V	|	|	|	|
10+45	0.4329	0.71	Q	V	|	|	|	|
10+50	0.4379	0.72	Q	V	|	|	|	|
10+55	0.4428	0.72	Q	V	|	|	|	|
11+ 0	0.4479	0.73	Q	V	|	|	|	|
11+ 5	0.4529	0.73	Q	V	|	|	|	|
11+10	0.4580	0.74	Q	V	|	|	|	|
11+15	0.4632	0.75	Q	V	|	|	|	|
11+20	0.4684	0.75	|Q	V	|	|	|	|
11+25	0.4736	0.76	|Q	V	|	|	|	|
11+30	0.4789	0.77	|Q	V	|	|	|	|
11+35	0.4842	0.77	|Q	V	|	|	|	|
11+40	0.4896	0.78	|Q	V	|	|	|	|
11+45	0.4950	0.79	|Q	V	|	|	|	|
11+50	0.5005	0.80	|Q	V	|	|	|	|
11+55	0.5061	0.80	|Q	V	|	|	|	|
12+ 0	0.5117	0.81	|Q	V	|	|	|	|
12+ 5	0.5173	0.82	|Q	V	|	|	|	|
12+10	0.5231	0.83	|Q	V	|	|	|	|
12+15	0.5289	0.85	|Q	V	|	|	|	|
12+20	0.5349	0.87	|Q	V	|	|	|	|
12+25	0.5410	0.89	|Q	V	|	|	|	|
12+30	0.5472	0.91	|Q	V	|	|	|	|
12+35	0.5536	0.93	|Q	V	|	|	|	|
12+40	0.5601	0.94	|Q	V	|	|	|	|
12+45	0.5667	0.96	|Q	V	|	|	|	|
12+50	0.5734	0.98	|Q	V	|	|	|	|
12+55	0.5802	0.99	|Q	V	|	|	|	|
13+ 0	0.5872	1.00	|Q	V	|	|	|	|
13+ 5	0.5942	1.02	|Q	V	|	|	|	|
13+10	0.6013	1.03	|Q	V	|	|	|	|
13+15	0.6085	1.05	|Q	V	|	|	|	|
13+20	0.6158	1.06	|Q	V	|	|	|	|
13+25	0.6232	1.08	|Q	V	|	|	|	|
13+30	0.6308	1.09	|Q	V	|	|	|	|
13+35	0.6384	1.11	|Q	V	|	|	|	|
13+40	0.6462	1.13	|Q	V	|	|	|	|
13+45	0.6540	1.14	|Q	V	|	|	|	|
13+50	0.6621	1.16	|Q	V	|	|	|	|
13+55	0.6702	1.18	|Q	V	|	|	|	|
14+ 0	0.6785	1.20	|Q	V	|	|	|	|
14+ 5	0.6869	1.22	|Q	V	|	|	|	|
14+10	0.6954	1.24	|Q	V	|	|	|	|
14+15	0.7042	1.27	|Q	V	|	|	|	|



14+20	0.7131	1.29	
14+25	0.7221	1.32	
14+30	0.7314	1.34	
14+35	0.7409	1.37	
14+40	0.7505	1.40	
14+45	0.7604	1.44	
14+50	0.7706	1.47	
14+55	0.7810	1.51	
15+ 0	0.7916	1.55	
15+ 5	0.8026	1.59	
15+10	0.8139	1.64	
15+15	0.8256	1.70	
15+20	0.8377	1.75	
15+25	0.8502	1.81	
15+30	0.8631	1.87	
15+35	0.8763	1.93	
15+40	0.8900	1.99	
15+45	0.9042	2.06	
15+50	0.9190	2.15	
15+55	0.9358	2.43	
16+ 0	0.9580	3.23	
16+ 5	1.0024	6.44	
16+10	1.0786	11.06	
16+15	1.1891	16.05	
16+20	1.3321	20.76	
16+25	1.4983	24.14	
16+30	1.6675	24.57	
16+35	1.8154	21.47	
16+40	1.9272	16.24	
16+45	2.0124	12.37	
16+50	2.0806	9.90	
16+55	2.1357	8.01	
17+ 0	2.1832	6.90	
17+ 5	2.2266	6.30	
17+10	2.2657	5.67	
17+15	2.3011	5.15	
17+20	2.3342	4.80	
17+25	2.3648	4.45	
17+30	2.3927	4.04	
17+35	2.4185	3.75	
17+40	2.4425	3.49	
17+45	2.4658	3.38	
17+50	2.4876	3.16	
17+55	2.5072	2.84	
18+ 0	2.5261	2.75	
18+ 5	2.5440	2.59	
18+10	2.5601	2.34	
18+15	2.5758	2.28	
18+20	2.5911	2.22	
18+25	2.6058	2.14	
18+30	2.6201	2.08	
18+35	2.6336	1.96	
18+40	2.6459	1.78	
18+45	2.6578	1.73	
18+50	2.6693	1.67	
18+55	2.6801	1.57	
19+ 0	2.6906	1.52	
19+ 5	2.7007	1.47	
19+10	2.7101	1.37	
19+15	2.7193	1.33	
19+20	2.7281	1.28	
19+25	2.7362	1.18	
19+30	2.7442	1.16	
19+35	2.7520	1.14	
19+40	2.7597	1.12	
19+45	2.7673	1.10	
19+50	2.7748	1.09	
19+55	2.7822	1.07	
20+ 0	2.7894	1.04	
20+ 5	2.7961	0.97	
20+10	2.8010	0.72	

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20+15       2.8058      0.70  Q         |         |         |      V  |
20+20       2.8105      0.69  Q         |         |         |      V  |
20+25       2.8152      0.67  Q         |         |         |      V  |
20+30       2.8198      0.66  Q         |         |         |      V  |
20+35       2.8242      0.65  Q         |         |         |      V  |
20+40       2.8287      0.64  Q         |         |         |      V  |
20+45       2.8330      0.63  Q         |         |         |      V  |
20+50       2.8373      0.62  Q         |         |         |      V  |
20+55       2.8416      0.62  Q         |         |         |      V  |
21+ 0       2.8458      0.61  Q         |         |         |      V  |
21+ 5       2.8499      0.60  Q         |         |         |       V |
21+10       2.8540      0.59  Q         |         |         |       V |
21+15       2.8580      0.59  Q         |         |         |       V |
21+20       2.8620      0.58  Q         |         |         |       V |
21+25       2.8659      0.57  Q         |         |         |       V |
21+30       2.8698      0.57  Q         |         |         |       V |
21+35       2.8737      0.56  Q         |         |         |       V |
21+40       2.8775      0.55  Q         |         |         |       V |
21+45       2.8813      0.55  Q         |         |         |       V |
21+50       2.8850      0.54  Q         |         |         |       V |
21+55       2.8887      0.54  Q         |         |         |       V |
22+ 0       2.8924      0.53  Q         |         |         |       V |
22+ 5       2.8960      0.53  Q         |         |         |       V |
22+10       2.8996      0.52  Q         |         |         |       V |
22+15       2.9031      0.52  Q         |         |         |       V |
22+20       2.9067      0.51  Q         |         |         |       V |
22+25       2.9102      0.51  Q         |         |         |       V |
22+30       2.9136      0.50  Q         |         |         |       V |
22+35       2.9171      0.50  Q         |         |         |       V |
22+40       2.9205      0.49  Q         |         |         |       V |
22+45       2.9238      0.49  Q         |         |         |       V |
22+50       2.9272      0.49  Q         |         |         |        V|
22+55       2.9305      0.48  Q         |         |         |        V|
23+ 0       2.9338      0.48  Q         |         |         |        V|
23+ 5       2.9371      0.48  Q         |         |         |        V|
23+10       2.9403      0.47  Q         |         |         |        V|
23+15       2.9436      0.47  Q         |         |         |        V|
23+20       2.9468      0.46  Q         |         |         |        V|
23+25       2.9499      0.46  Q         |         |         |        V|
23+30       2.9531      0.46  Q         |         |         |        V|
23+35       2.9562      0.45  Q         |         |         |        V|
23+40       2.9593      0.45  Q         |         |         |        V|
23+45       2.9624      0.45  Q         |         |         |        V|
23+50       2.9655      0.44  Q         |         |         |        V|
23+55       2.9685      0.44  Q         |         |         |        V|
24+ 0       2.9715      0.44  Q         |         |         |        V|
24+ 5       2.9745      0.43  Q         |         |         |        V|
24+10       2.9773      0.41  Q         |         |         |        V|
24+15       2.9800      0.38  Q         |         |         |        V|
24+20       2.9823      0.34  Q         |         |         |        V|
24+25       2.9844      0.30  Q         |         |         |        V|
24+30       2.9861      0.25  Q         |         |         |        V|
24+35       2.9875      0.20  Q         |         |         |        V|
24+40       2.9886      0.17  Q         |         |         |        V|
24+45       2.9896      0.15  Q         |         |         |        V|
24+50       2.9905      0.13  Q         |         |         |        V|
24+55       2.9913      0.11  Q         |         |         |        V|
25+ 0       2.9920      0.10  Q         |         |         |        V|
25+ 5       2.9927      0.09  Q         |         |         |        V|
25+10       2.9933      0.09  Q         |         |         |        V|
25+15       2.9938      0.08  Q         |         |         |        V|
25+20       2.9943      0.07  Q         |         |         |        V|
25+25       2.9947      0.06  Q         |         |         |        V|
25+30       2.9951      0.06  Q         |         |         |        V|
25+35       2.9955      0.05  Q         |         |         |        V|
25+40       2.9958      0.05  Q         |         |         |        V|
25+45       2.9961      0.04  Q         |         |         |        V|
25+50       2.9964      0.04  Q         |         |         |        V|
25+55       2.9967      0.04  Q         |         |         |        V|
26+ 0       2.9969      0.03  Q         |         |         |        V|
26+ 5       2.9971      0.03  Q         |         |         |        V|
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   26+10       2.9973      0.03  Q          |          |          |         V|
   26+15       2.9975      0.03  Q          |          |          |         V|
   26+20       2.9977      0.02  Q          |          |          |         V|
   26+25       2.9978      0.02  Q          |          |          |         V|
   26+30       2.9980      0.02  Q          |          |          |         V|
   26+35       2.9981      0.02  Q          |          |          |         V|
   26+40       2.9982      0.02  Q          |          |          |         V|
   26+45       2.9983      0.01  Q          |          |          |         V|
   26+50       2.9984      0.01  Q          |          |          |         V|
   26+55       2.9985      0.01  Q          |          |          |         V|
   27+ 0       2.9985      0.01  Q          |          |          |         V|
   27+ 5       2.9986      0.01  Q          |          |          |         V|
   27+10       2.9987      0.01  Q          |          |          |         V|
   27+15       2.9987      0.01  Q          |          |          |         V|
   27+20       2.9988      0.01  Q          |          |          |         V|
   27+25       2.9988      0.01  Q          |          |          |         V|
   27+30       2.9988      0.00  Q          |          |          |         V|
   27+35       2.9989      0.00  Q          |          |          |         V|
   27+40       2.9989      0.00  Q          |          |          |         V|
   27+45       2.9989      0.00  Q          |          |          |         V|
   27+50       2.9989      0.00  Q          |          |          |         V|
   27+55       2.9989      0.00  Q          |          |          |         V|
   28+ 0       2.9989      0.00  Q          |          |          |          V
-------------------------------------------------------------------------------
```

APPENDIX C.2: UNIT HYDROGRAPH ANALYSIS, AREA "CD"

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

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Study date 06/21/18

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

Program License Serial Number 6279

BLOOMINGTON COMMERCE CENTER POST-PROJECT CONDITION ONSITE HYDROLOGY
UNIT HYDROGRAPH ANALYSIS, 100-YEAR STORM EVENT
FILENAME: ARCD

Storm Event Year = 100

Antecedent Moisture Condition = 2

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 100		
25.93	1	1.30
Rainfall data for year 100		
25.93	6	3.09
Rainfall data for year 100		
25.93	24	5.66

++

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

SCS curve No.(AMCII)	SCS curve NO.(AMC 2)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
46.0	46.0	25.93	1.000	0.856	1.000	0.856

Area-averaged adjusted loss rate Fm (In/Hr) = 0.856

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

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC2)	S	Pervious Yield Fr
25.93	1.000	46.0	46.0	11.74	0.129

Area-averaged catchment yield fraction, Y = 0.129
Area-averaged low loss fraction, Yb = 0.871
User entry of time of concentration = 0.409 (hours)

++
Watershed area = 25.93(Ac.)

Catchment Lag time = 0.327 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 25.4562
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.856(In/Hr)
Average low loss rate fraction (Yb) = 0.871 (decimal)
VALLEY UNDEVELOPED S-Graph Selected
Computed peak 5-minute rainfall = 0.481(In)
Computed peak 30-minute rainfall = 0.985(In)
Specified peak 1-hour rainfall = 1.300(In)
Computed peak 3-hour rainfall = 2.211(In)
Specified peak 6-hour rainfall = 3.090(In)
Specified peak 24-hour rainfall = 5.660(In)

Rainfall depth area reduction factors:
Using a total area of 25.93(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999 Adjusted rainfall = 0.481(In)
30-minute factor = 0.999 Adjusted rainfall = 0.984(In)
1-hour factor = 0.999 Adjusted rainfall = 1.298(In)
3-hour factor = 1.000 Adjusted rainfall = 2.210(In)
6-hour factor = 1.000 Adjusted rainfall = 3.090(In)
24-hour factor = 1.000 Adjusted rainfall = 5.660(In)

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

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 313.59 (CFS))		
1	2.350	7.369
2	10.246	24.763
3	24.309	44.098
4	42.137	55.907
5	57.310	47.580
6	66.634	29.241
7	72.566	18.603
8	76.649	12.803
9	79.959	10.379
10	82.678	8.529
11	85.014	7.323
12	86.971	6.137
13	88.592	5.085
14	90.107	4.749
15	91.341	3.871
16	92.449	3.473
17	93.341	2.798
18	94.153	2.546
19	94.928	2.431
20	95.679	2.354
21	96.281	1.888
22	96.833	1.731
23	97.310	1.495
24	97.759	1.407
25	98.131	1.169
26	98.477	1.083
27	98.746	0.844
28	99.000	0.798
29	99.255	0.798
30	99.510	0.798
31	99.764	0.798
32	100.000	0.740

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.4806	0.4806
2	0.6341	0.1535
3	0.7457	0.1117

4	0.8367	0.0909
5	0.9148	0.0781
6	0.9840	0.0692
7	1.0466	0.0626
8	1.1040	0.0574
9	1.1573	0.0533
10	1.2071	0.0498
11	1.2540	0.0469
12	1.2984	0.0444
13	1.3497	0.0513
14	1.3990	0.0493
15	1.4466	0.0475
16	1.4925	0.0459
17	1.5369	0.0445
18	1.5801	0.0431
19	1.6220	0.0419
20	1.6628	0.0408
21	1.7025	0.0397
22	1.7413	0.0388
23	1.7792	0.0379
24	1.8162	0.0370
25	1.8525	0.0363
26	1.8880	0.0355
27	1.9228	0.0348
28	1.9570	0.0342
29	1.9905	0.0335
30	2.0234	0.0329
31	2.0558	0.0324
32	2.0877	0.0318
33	2.1190	0.0313
34	2.1499	0.0309
35	2.1802	0.0304
36	2.2102	0.0299
37	2.2397	0.0295
38	2.2687	0.0291
39	2.2974	0.0287
40	2.3257	0.0283
41	2.3536	0.0279
42	2.3811	0.0276
43	2.4084	0.0272
44	2.4353	0.0269
45	2.4619	0.0266
46	2.4882	0.0263
47	2.5142	0.0260
48	2.5399	0.0257
49	2.5653	0.0254
50	2.5905	0.0252
51	2.6154	0.0249
52	2.6401	0.0247
53	2.6645	0.0244
54	2.6887	0.0242
55	2.7126	0.0240
56	2.7363	0.0237
57	2.7599	0.0235
58	2.7832	0.0233
59	2.8062	0.0231
60	2.8291	0.0229
61	2.8518	0.0227
62	2.8743	0.0225
63	2.8966	0.0223
64	2.9188	0.0221
65	2.9407	0.0220
66	2.9625	0.0218
67	2.9841	0.0216
68	3.0056	0.0214
69	3.0268	0.0213
70	3.0480	0.0211
71	3.0689	0.0210
72	3.0897	0.0208
73	3.1084	0.0187
74	3.1269	0.0185

75	3.1453	0.0184
76	3.1636	0.0182
77	3.1817	0.0181
78	3.1996	0.0180
79	3.2175	0.0178
80	3.2352	0.0177
81	3.2528	0.0176
82	3.2703	0.0175
83	3.2876	0.0174
84	3.3049	0.0172
85	3.3220	0.0171
86	3.3390	0.0170
87	3.3559	0.0169
88	3.3727	0.0168
89	3.3894	0.0167
90	3.4059	0.0166
91	3.4224	0.0165
92	3.4388	0.0164
93	3.4551	0.0163
94	3.4712	0.0162
95	3.4873	0.0161
96	3.5033	0.0160
97	3.5192	0.0159
98	3.5350	0.0158
99	3.5507	0.0157
100	3.5663	0.0156
101	3.5818	0.0155
102	3.5973	0.0154
103	3.6126	0.0154
104	3.6279	0.0153
105	3.6431	0.0152
106	3.6582	0.0151
107	3.6732	0.0150
108	3.6882	0.0149
109	3.7030	0.0149
110	3.7178	0.0148
111	3.7326	0.0147
112	3.7472	0.0146
113	3.7618	0.0146
114	3.7763	0.0145
115	3.7907	0.0144
116	3.8051	0.0144
117	3.8193	0.0143
118	3.8336	0.0142
119	3.8477	0.0142
120	3.8618	0.0141
121	3.8758	0.0140
122	3.8898	0.0140
123	3.9037	0.0139
124	3.9175	0.0138
125	3.9312	0.0138
126	3.9450	0.0137
127	3.9586	0.0136
128	3.9722	0.0136
129	3.9857	0.0135
130	3.9992	0.0135
131	4.0126	0.0134
132	4.0259	0.0133
133	4.0392	0.0133
134	4.0524	0.0132
135	4.0656	0.0132
136	4.0787	0.0131
137	4.0918	0.0131
138	4.1048	0.0130
139	4.1178	0.0130
140	4.1307	0.0129
141	4.1435	0.0129
142	4.1563	0.0128
143	4.1691	0.0128
144	4.1818	0.0127
145	4.1945	0.0127

146	4.2071	0.0126
147	4.2196	0.0126
148	4.2321	0.0125
149	4.2446	0.0125
150	4.2570	0.0124
151	4.2694	0.0124
152	4.2817	0.0123
153	4.2940	0.0123
154	4.3062	0.0122
155	4.3184	0.0122
156	4.3305	0.0121
157	4.3426	0.0121
158	4.3547	0.0121
159	4.3667	0.0120
160	4.3787	0.0120
161	4.3906	0.0119
162	4.4025	0.0119
163	4.4143	0.0118
164	4.4261	0.0118
165	4.4379	0.0118
166	4.4496	0.0117
167	4.4613	0.0117
168	4.4729	0.0116
169	4.4846	0.0116
170	4.4961	0.0116
171	4.5077	0.0115
172	4.5191	0.0115
173	4.5306	0.0115
174	4.5420	0.0114
175	4.5534	0.0114
176	4.5647	0.0113
177	4.5760	0.0113
178	4.5873	0.0113
179	4.5985	0.0112
180	4.6097	0.0112
181	4.6209	0.0112
182	4.6320	0.0111
183	4.6431	0.0111
184	4.6542	0.0111
185	4.6652	0.0110
186	4.6762	0.0110
187	4.6872	0.0110
188	4.6981	0.0109
189	4.7090	0.0109
190	4.7199	0.0109
191	4.7307	0.0108
192	4.7415	0.0108
193	4.7523	0.0108
194	4.7630	0.0107
195	4.7737	0.0107
196	4.7844	0.0107
197	4.7950	0.0106
198	4.8056	0.0106
199	4.8162	0.0106
200	4.8268	0.0106
201	4.8373	0.0105
202	4.8478	0.0105
203	4.8582	0.0105
204	4.8687	0.0104
205	4.8791	0.0104
206	4.8895	0.0104
207	4.8998	0.0103
208	4.9101	0.0103
209	4.9204	0.0103
210	4.9307	0.0103
211	4.9409	0.0102
212	4.9511	0.0102
213	4.9613	0.0102
214	4.9715	0.0102
215	4.9816	0.0101
216	4.9917	0.0101

217	5.0018	0.0101
218	5.0118	0.0101
219	5.0219	0.0100
220	5.0319	0.0100
221	5.0418	0.0100
222	5.0518	0.0099
223	5.0617	0.0099
224	5.0716	0.0099
225	5.0815	0.0099
226	5.0913	0.0098
227	5.1012	0.0098
228	5.1110	0.0098
229	5.1207	0.0098
230	5.1305	0.0098
231	5.1402	0.0097
232	5.1499	0.0097
233	5.1596	0.0097
234	5.1693	0.0097
235	5.1789	0.0096
236	5.1885	0.0096
237	5.1981	0.0096
238	5.2077	0.0096
239	5.2172	0.0095
240	5.2267	0.0095
241	5.2362	0.0095
242	5.2457	0.0095
243	5.2551	0.0095
244	5.2646	0.0094
245	5.2740	0.0094
246	5.2834	0.0094
247	5.2927	0.0094
248	5.3021	0.0093
249	5.3114	0.0093
250	5.3207	0.0093
251	5.3300	0.0093
252	5.3393	0.0093
253	5.3485	0.0092
254	5.3577	0.0092
255	5.3669	0.0092
256	5.3761	0.0092
257	5.3853	0.0092
258	5.3944	0.0091
259	5.4035	0.0091
260	5.4126	0.0091
261	5.4217	0.0091
262	5.4308	0.0091
263	5.4398	0.0090
264	5.4488	0.0090
265	5.4578	0.0090
266	5.4668	0.0090
267	5.4758	0.0090
268	5.4847	0.0089
269	5.4936	0.0089
270	5.5026	0.0089
271	5.5114	0.0089
272	5.5203	0.0089
273	5.5292	0.0089
274	5.5380	0.0088
275	5.5468	0.0088
276	5.5556	0.0088
277	5.5644	0.0088
278	5.5732	0.0088
279	5.5819	0.0087
280	5.5906	0.0087
281	5.5993	0.0087
282	5.6080	0.0087
283	5.6167	0.0087
284	5.6254	0.0087
285	5.6340	0.0086
286	5.6426	0.0086
287	5.6512	0.0086

288 5.6598 0.0086

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0086	0.0075	0.0011
2	0.0086	0.0075	0.0011
3	0.0086	0.0075	0.0011
4	0.0087	0.0075	0.0011
5	0.0087	0.0076	0.0011
6	0.0087	0.0076	0.0011
7	0.0087	0.0076	0.0011
8	0.0088	0.0076	0.0011
9	0.0088	0.0077	0.0011
10	0.0088	0.0077	0.0011
11	0.0089	0.0077	0.0011
12	0.0089	0.0077	0.0011
13	0.0089	0.0078	0.0011
14	0.0089	0.0078	0.0011
15	0.0090	0.0078	0.0012
16	0.0090	0.0078	0.0012
17	0.0090	0.0079	0.0012
18	0.0090	0.0079	0.0012
19	0.0091	0.0079	0.0012
20	0.0091	0.0079	0.0012
21	0.0091	0.0080	0.0012
22	0.0092	0.0080	0.0012
23	0.0092	0.0080	0.0012
24	0.0092	0.0080	0.0012
25	0.0093	0.0081	0.0012
26	0.0093	0.0081	0.0012
27	0.0093	0.0081	0.0012
28	0.0093	0.0081	0.0012
29	0.0094	0.0082	0.0012
30	0.0094	0.0082	0.0012
31	0.0095	0.0082	0.0012
32	0.0095	0.0083	0.0012
33	0.0095	0.0083	0.0012
34	0.0095	0.0083	0.0012
35	0.0096	0.0084	0.0012
36	0.0096	0.0084	0.0012
37	0.0097	0.0084	0.0012
38	0.0097	0.0084	0.0012
39	0.0097	0.0085	0.0013
40	0.0098	0.0085	0.0013
41	0.0098	0.0085	0.0013
42	0.0098	0.0086	0.0013
43	0.0099	0.0086	0.0013
44	0.0099	0.0086	0.0013
45	0.0099	0.0087	0.0013
46	0.0100	0.0087	0.0013
47	0.0100	0.0087	0.0013
48	0.0101	0.0088	0.0013
49	0.0101	0.0088	0.0013
50	0.0101	0.0088	0.0013
51	0.0102	0.0089	0.0013
52	0.0102	0.0089	0.0013
53	0.0103	0.0089	0.0013
54	0.0103	0.0090	0.0013
55	0.0103	0.0090	0.0013
56	0.0104	0.0090	0.0013
57	0.0104	0.0091	0.0013
58	0.0105	0.0091	0.0013
59	0.0105	0.0092	0.0014
60	0.0106	0.0092	0.0014
61	0.0106	0.0092	0.0014
62	0.0106	0.0093	0.0014
63	0.0107	0.0093	0.0014
64	0.0107	0.0094	0.0014
65	0.0108	0.0094	0.0014

66	0.0108	0.0094	0.0014
67	0.0109	0.0095	0.0014
68	0.0109	0.0095	0.0014
69	0.0110	0.0096	0.0014
70	0.0110	0.0096	0.0014
71	0.0111	0.0097	0.0014
72	0.0111	0.0097	0.0014
73	0.0112	0.0098	0.0014
74	0.0112	0.0098	0.0014
75	0.0113	0.0099	0.0015
76	0.0113	0.0099	0.0015
77	0.0114	0.0099	0.0015
78	0.0115	0.0100	0.0015
79	0.0115	0.0100	0.0015
80	0.0116	0.0101	0.0015
81	0.0116	0.0101	0.0015
82	0.0117	0.0102	0.0015
83	0.0118	0.0102	0.0015
84	0.0118	0.0103	0.0015
85	0.0119	0.0104	0.0015
86	0.0119	0.0104	0.0015
87	0.0120	0.0105	0.0015
88	0.0121	0.0105	0.0016
89	0.0121	0.0106	0.0016
90	0.0122	0.0106	0.0016
91	0.0123	0.0107	0.0016
92	0.0123	0.0107	0.0016
93	0.0124	0.0108	0.0016
94	0.0125	0.0109	0.0016
95	0.0126	0.0109	0.0016
96	0.0126	0.0110	0.0016
97	0.0127	0.0111	0.0016
98	0.0128	0.0111	0.0016
99	0.0129	0.0112	0.0017
100	0.0129	0.0112	0.0017
101	0.0130	0.0113	0.0017
102	0.0131	0.0114	0.0017
103	0.0132	0.0115	0.0017
104	0.0132	0.0115	0.0017
105	0.0133	0.0116	0.0017
106	0.0134	0.0117	0.0017
107	0.0135	0.0118	0.0017
108	0.0136	0.0118	0.0017
109	0.0137	0.0119	0.0018
110	0.0138	0.0120	0.0018
111	0.0139	0.0121	0.0018
112	0.0140	0.0122	0.0018
113	0.0141	0.0123	0.0018
114	0.0142	0.0123	0.0018
115	0.0143	0.0124	0.0018
116	0.0144	0.0125	0.0018
117	0.0145	0.0126	0.0019
118	0.0146	0.0127	0.0019
119	0.0147	0.0128	0.0019
120	0.0148	0.0129	0.0019
121	0.0149	0.0130	0.0019
122	0.0150	0.0131	0.0019
123	0.0152	0.0132	0.0020
124	0.0153	0.0133	0.0020
125	0.0154	0.0135	0.0020
126	0.0155	0.0135	0.0020
127	0.0157	0.0137	0.0020
128	0.0158	0.0138	0.0020
129	0.0160	0.0139	0.0021
130	0.0161	0.0140	0.0021
131	0.0163	0.0142	0.0021
132	0.0164	0.0143	0.0021
133	0.0166	0.0144	0.0021
134	0.0167	0.0145	0.0021
135	0.0169	0.0147	0.0022
136	0.0170	0.0148	0.0022

137	0.0172	0.0150	0.0022
138	0.0174	0.0151	0.0022
139	0.0176	0.0153	0.0023
140	0.0177	0.0154	0.0023
141	0.0180	0.0157	0.0023
142	0.0181	0.0158	0.0023
143	0.0184	0.0160	0.0024
144	0.0185	0.0161	0.0024
145	0.0208	0.0181	0.0027
146	0.0210	0.0183	0.0027
147	0.0213	0.0185	0.0027
148	0.0214	0.0187	0.0028
149	0.0218	0.0190	0.0028
150	0.0220	0.0191	0.0028
151	0.0223	0.0194	0.0029
152	0.0225	0.0196	0.0029
153	0.0229	0.0199	0.0029
154	0.0231	0.0201	0.0030
155	0.0235	0.0205	0.0030
156	0.0237	0.0207	0.0031
157	0.0242	0.0211	0.0031
158	0.0244	0.0213	0.0031
159	0.0249	0.0217	0.0032
160	0.0252	0.0219	0.0032
161	0.0257	0.0224	0.0033
162	0.0260	0.0227	0.0033
163	0.0266	0.0232	0.0034
164	0.0269	0.0234	0.0035
165	0.0276	0.0240	0.0036
166	0.0279	0.0243	0.0036
167	0.0287	0.0250	0.0037
168	0.0291	0.0253	0.0037
169	0.0299	0.0261	0.0039
170	0.0304	0.0265	0.0039
171	0.0313	0.0273	0.0040
172	0.0318	0.0277	0.0041
173	0.0329	0.0287	0.0042
174	0.0335	0.0292	0.0043
175	0.0348	0.0303	0.0045
176	0.0355	0.0309	0.0046
177	0.0370	0.0323	0.0048
178	0.0379	0.0330	0.0049
179	0.0397	0.0346	0.0051
180	0.0408	0.0355	0.0053
181	0.0431	0.0376	0.0056
182	0.0445	0.0387	0.0057
183	0.0475	0.0414	0.0061
184	0.0493	0.0430	0.0063
185	0.0444	0.0387	0.0057
186	0.0469	0.0409	0.0060
187	0.0533	0.0464	0.0069
188	0.0574	0.0500	0.0074
189	0.0692	0.0603	0.0089
190	0.0781	0.0681	0.0101
191	0.1117	0.0713	0.0404
192	0.1535	0.0713	0.0822
193	0.4806	0.0713	0.4093
194	0.0909	0.0713	0.0197
195	0.0626	0.0545	0.0081
196	0.0498	0.0434	0.0064
197	0.0513	0.0447	0.0066
198	0.0459	0.0400	0.0059
199	0.0419	0.0365	0.0054
200	0.0388	0.0338	0.0050
201	0.0363	0.0316	0.0047
202	0.0342	0.0298	0.0044
203	0.0324	0.0282	0.0042
204	0.0309	0.0269	0.0040
205	0.0295	0.0257	0.0038
206	0.0283	0.0246	0.0036
207	0.0272	0.0237	0.0035

208	0.0263	0.0229	0.0034
209	0.0254	0.0222	0.0033
210	0.0247	0.0215	0.0032
211	0.0240	0.0209	0.0031
212	0.0233	0.0203	0.0030
213	0.0227	0.0198	0.0029
214	0.0221	0.0193	0.0029
215	0.0216	0.0188	0.0028
216	0.0211	0.0184	0.0027
217	0.0187	0.0163	0.0024
218	0.0182	0.0159	0.0023
219	0.0178	0.0155	0.0023
220	0.0175	0.0152	0.0023
221	0.0171	0.0149	0.0022
222	0.0168	0.0146	0.0022
223	0.0165	0.0144	0.0021
224	0.0162	0.0141	0.0021
225	0.0159	0.0138	0.0020
226	0.0156	0.0136	0.0020
227	0.0154	0.0134	0.0020
228	0.0151	0.0132	0.0019
229	0.0149	0.0130	0.0019
230	0.0146	0.0128	0.0019
231	0.0144	0.0126	0.0019
232	0.0142	0.0124	0.0018
233	0.0140	0.0122	0.0018
234	0.0138	0.0120	0.0018
235	0.0136	0.0119	0.0018
236	0.0135	0.0117	0.0017
237	0.0133	0.0116	0.0017
238	0.0131	0.0114	0.0017
239	0.0130	0.0113	0.0017
240	0.0128	0.0112	0.0016
241	0.0127	0.0110	0.0016
242	0.0125	0.0109	0.0016
243	0.0124	0.0108	0.0016
244	0.0122	0.0107	0.0016
245	0.0121	0.0105	0.0016
246	0.0120	0.0104	0.0015
247	0.0118	0.0103	0.0015
248	0.0117	0.0102	0.0015
249	0.0116	0.0101	0.0015
250	0.0115	0.0100	0.0015
251	0.0114	0.0099	0.0015
252	0.0113	0.0098	0.0015
253	0.0112	0.0097	0.0014
254	0.0111	0.0096	0.0014
255	0.0110	0.0095	0.0014
256	0.0109	0.0095	0.0014
257	0.0108	0.0094	0.0014
258	0.0107	0.0093	0.0014
259	0.0106	0.0092	0.0014
260	0.0105	0.0091	0.0014
261	0.0104	0.0091	0.0013
262	0.0103	0.0090	0.0013
263	0.0102	0.0089	0.0013
264	0.0102	0.0088	0.0013
265	0.0101	0.0088	0.0013
266	0.0100	0.0087	0.0013
267	0.0099	0.0086	0.0013
268	0.0098	0.0086	0.0013
269	0.0098	0.0085	0.0013
270	0.0097	0.0085	0.0012
271	0.0096	0.0084	0.0012
272	0.0096	0.0083	0.0012
273	0.0095	0.0083	0.0012
274	0.0094	0.0082	0.0012
275	0.0094	0.0082	0.0012
276	0.0093	0.0081	0.0012
277	0.0092	0.0081	0.0012
278	0.0092	0.0080	0.0012

279	0.0091	0.0079	0.0012
280	0.0091	0.0079	0.0012
281	0.0090	0.0078	0.0012
282	0.0089	0.0078	0.0012
283	0.0089	0.0077	0.0011
284	0.0088	0.0077	0.0011
285	0.0088	0.0076	0.0011
286	0.0087	0.0076	0.0011
287	0.0087	0.0076	0.0011
288	0.0086	0.0075	0.0011

Total soil rain loss = 4.49(In)
Total effective rainfall = 1.17(In)
Peak flow rate in flood hydrograph = 29.81(CFS)

24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	7.5	15.0	22.5	30.0
0+ 5	0.0001	0.01	Q				
0+10	0.0003	0.04	Q				
0+15	0.0009	0.08	Q				
0+20	0.0019	0.15	Q				
0+25	0.0033	0.20	Q				
0+30	0.0049	0.23	Q				
0+35	0.0066	0.25	Q				
0+40	0.0085	0.27	Q				
0+45	0.0104	0.28	Q				
0+50	0.0124	0.29	Q				
0+55	0.0145	0.30	Q				
1+ 0	0.0166	0.31	Q				
1+ 5	0.0188	0.31	Q				
1+10	0.0210	0.32	Q				
1+15	0.0232	0.33	Q				
1+20	0.0255	0.33	Q				
1+25	0.0278	0.33	Q				
1+30	0.0301	0.34	Q				
1+35	0.0325	0.34	Q				
1+40	0.0349	0.35	Q				
1+45	0.0373	0.35	Q				
1+50	0.0397	0.35	Q				
1+55	0.0421	0.36	Q				
2+ 0	0.0446	0.36	Q				
2+ 5	0.0471	0.36	Q				
2+10	0.0496	0.36	Q				
2+15	0.0521	0.36	Q				
2+20	0.0546	0.37	Q				
2+25	0.0572	0.37	Q				
2+30	0.0597	0.37	Q				
2+35	0.0623	0.37	Q				
2+40	0.0649	0.38	QV				
2+45	0.0675	0.38	QV				
2+50	0.0701	0.38	QV				
2+55	0.0727	0.38	QV				
3+ 0	0.0753	0.38	QV				
3+ 5	0.0779	0.38	QV				
3+10	0.0806	0.38	QV				
3+15	0.0832	0.38	QV				
3+20	0.0859	0.39	QV				
3+25	0.0886	0.39	QV				
3+30	0.0912	0.39	QV				
3+35	0.0939	0.39	QV				
3+40	0.0966	0.39	QV				
3+45	0.0993	0.39	QV				
3+50	0.1020	0.39	QV				

3+55	0.1048	0.40	QV	|	|	|	|
4+ 0	0.1075	0.40	QV	|	|	|	|
4+ 5	0.1102	0.40	QV	|	|	|	|
4+10	0.1130	0.40	QV	|	|	|	|
4+15	0.1158	0.40	QV	|	|	|	|
4+20	0.1185	0.40	QV	|	|	|	|
4+25	0.1213	0.40	QV	|	|	|	|
4+30	0.1241	0.41	QV	|	|	|	|
4+35	0.1269	0.41	Q V	|	|	|	|
4+40	0.1298	0.41	Q V	|	|	|	|
4+45	0.1326	0.41	Q V	|	|	|	|
4+50	0.1354	0.41	Q V	|	|	|	|
4+55	0.1383	0.41	Q V	|	|	|	|
5+ 0	0.1412	0.42	Q V	|	|	|	|
5+ 5	0.1441	0.42	Q V	|	|	|	|
5+10	0.1469	0.42	Q V	|	|	|	|
5+15	0.1498	0.42	Q V	|	|	|	|
5+20	0.1528	0.42	Q V	|	|	|	|
5+25	0.1557	0.43	Q V	|	|	|	|
5+30	0.1586	0.43	Q V	|	|	|	|
5+35	0.1616	0.43	Q V	|	|	|	|
5+40	0.1645	0.43	Q V	|	|	|	|
5+45	0.1675	0.43	Q V	|	|	|	|
5+50	0.1705	0.43	Q V	|	|	|	|
5+55	0.1735	0.44	Q V	|	|	|	|
6+ 0	0.1765	0.44	Q V	|	|	|	|
6+ 5	0.1796	0.44	Q V	|	|	|	|
6+10	0.1826	0.44	Q V	|	|	|	|
6+15	0.1857	0.44	Q V	|	|	|	|
6+20	0.1887	0.45	Q V	|	|	|	|
6+25	0.1918	0.45	Q V	|	|	|	|
6+30	0.1949	0.45	Q V	|	|	|	|
6+35	0.1981	0.45	Q V	|	|	|	|
6+40	0.2012	0.45	Q V	|	|	|	|
6+45	0.2043	0.46	Q V	|	|	|	|
6+50	0.2075	0.46	Q V	|	|	|	|
6+55	0.2107	0.46	Q V	|	|	|	|
7+ 0	0.2139	0.46	Q V	|	|	|	|
7+ 5	0.2171	0.47	Q V	|	|	|	|
7+10	0.2203	0.47	Q V	|	|	|	|
7+15	0.2235	0.47	Q V	|	|	|	|
7+20	0.2268	0.47	Q V	|	|	|	|
7+25	0.2301	0.48	Q V	|	|	|	|
7+30	0.2334	0.48	Q V	|	|	|	|
7+35	0.2367	0.48	Q V	|	|	|	|
7+40	0.2400	0.48	Q V	|	|	|	|
7+45	0.2433	0.49	Q V	|	|	|	|
7+50	0.2467	0.49	Q V	|	|	|	|
7+55	0.2501	0.49	Q V	|	|	|	|
8+ 0	0.2535	0.49	Q V	|	|	|	|
8+ 5	0.2569	0.50	Q V	|	|	|	|
8+10	0.2603	0.50	Q V	|	|	|	|
8+15	0.2638	0.50	Q V	|	|	|	|
8+20	0.2673	0.50	Q V	|	|	|	|
8+25	0.2708	0.51	Q V	|	|	|	|
8+30	0.2743	0.51	Q V	|	|	|	|
8+35	0.2778	0.51	Q V	|	|	|	|
8+40	0.2814	0.52	Q V	|	|	|	|
8+45	0.2849	0.52	Q V	|	|	|	|
8+50	0.2885	0.52	Q V	|	|	|	|
8+55	0.2922	0.53	Q V	|	|	|	|
9+ 0	0.2958	0.53	Q V	|	|	|	|
9+ 5	0.2995	0.53	Q V	|	|	|	|
9+10	0.3032	0.54	Q V	|	|	|	|
9+15	0.3069	0.54	Q V	|	|	|	|
9+20	0.3106	0.54	Q V	|	|	|	|
9+25	0.3144	0.55	Q V	|	|	|	|
9+30	0.3182	0.55	Q V	|	|	|	|
9+35	0.3220	0.55	Q V	|	|	|	|
9+40	0.3258	0.56	Q V	|	|	|	|
9+45	0.3297	0.56	Q V	|	|	|	|

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 9+50      0.3336     0.57  Q    V    |         |         |         |
 9+55      0.3375     0.57  Q    V    |         |         |         |
10+ 0      0.3415     0.57  Q    V    |         |         |         |
10+ 5      0.3455     0.58  Q    V    |         |         |         |
10+10      0.3495     0.58  Q    V    |         |         |         |
10+15      0.3535     0.59  Q    V    |         |         |         |
10+20      0.3576     0.59  Q    V    |         |         |         |
10+25      0.3617     0.60  Q    V    |         |         |         |
10+30      0.3658     0.60  Q    V    |         |         |         |
10+35      0.3700     0.60  Q    V    |         |         |         |
10+40      0.3742     0.61  Q    V    |         |         |         |
10+45      0.3784     0.61  Q    V    |         |         |         |
10+50      0.3827     0.62  Q     V   |         |         |         |
10+55      0.3870     0.62  Q     V   |         |         |         |
11+ 0      0.3913     0.63  Q     V   |         |         |         |
11+ 5      0.3957     0.64  Q     V   |         |         |         |
11+10      0.4001     0.64  Q     V   |         |         |         |
11+15      0.4046     0.65  Q     V   |         |         |         |
11+20      0.4090     0.65  Q     V   |         |         |         |
11+25      0.4136     0.66  Q     V   |         |         |         |
11+30      0.4182     0.66  Q     V   |         |         |         |
11+35      0.4228     0.67  Q     V   |         |         |         |
11+40      0.4275     0.68  Q     V   |         |         |         |
11+45      0.4322     0.68  Q     V   |         |         |         |
11+50      0.4369     0.69  Q     V   |         |         |         |
11+55      0.4417     0.70  Q     V   |         |         |         |
12+ 0      0.4466     0.71  Q      V  |         |         |         |
12+ 5      0.4515     0.71  Q      V  |         |         |         |
12+10      0.4565     0.73  Q      V  |         |         |         |
12+15      0.4617     0.75  Q      V  |         |         |         |
12+20      0.4670     0.77  |Q     V  |         |         |         |
12+25      0.4724     0.79  |Q     V  |         |         |         |
12+30      0.4780     0.81  |Q     V  |         |         |         |
12+35      0.4837     0.82  |Q     V  |         |         |         |
12+40      0.4894     0.83  |Q     V  |         |         |         |
12+45      0.4952     0.85  |Q     V  |         |         |         |
12+50      0.5012     0.86  |Q     V  |         |         |         |
12+55      0.5072     0.87  |Q      V |         |         |         |
13+ 0      0.5133     0.88  |Q      V |         |         |         |
13+ 5      0.5194     0.90  |Q      V |         |         |         |
13+10      0.5257     0.91  |Q      V |         |         |         |
13+15      0.5320     0.92  |Q      V |         |         |         |
13+20      0.5385     0.94  |Q      V |         |         |         |
13+25      0.5450     0.95  |Q      V |         |         |         |
13+30      0.5517     0.96  |Q      V |         |         |         |
13+35      0.5584     0.98  |Q      V |         |         |         |
13+40      0.5653     0.99  |Q      V |         |         |         |
13+45      0.5722     1.01  |Q       V|         |         |         |
13+50      0.5793     1.03  |Q       V|         |         |         |
13+55      0.5865     1.04  |Q       V|         |         |         |
14+ 0      0.5938     1.06  |Q       V|         |         |         |
14+ 5      0.6013     1.08  |Q       V|         |         |         |
14+10      0.6089     1.10  |Q       V|         |         |         |
14+15      0.6166     1.13  |Q       V|         |         |         |
14+20      0.6245     1.15  |Q       V|         |         |         |
14+25      0.6326     1.17  |Q       V|         |         |         |
14+30      0.6409     1.20  |Q        V         |         |         |
14+35      0.6493     1.23  |Q        V         |         |         |
14+40      0.6580     1.26  |Q        V         |         |         |
14+45      0.6668     1.29  |Q        V         |         |         |
14+50      0.6759     1.32  |Q        V         |         |         |
14+55      0.6853     1.36  |Q        V         |         |         |
15+ 0      0.6949     1.40  |Q        V         |         |         |
15+ 5      0.7048     1.44  |Q        |V        |         |         |
15+10      0.7151     1.49  |Q        |V        |         |         |
15+15      0.7258     1.55  | Q       |V        |         |         |
15+20      0.7368     1.61  | Q       |V        |         |         |
15+25      0.7483     1.67  | Q       |V        |         |         |
15+30      0.7601     1.71  | Q       | V       |         |         |
15+35      0.7722     1.75  | Q       | V       |         |         |
15+40      0.7845     1.80  | Q       | V       |         |         |
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15+45	0.7974	1.87	Q	V			
15+50	0.8112	2.00	Q	V			
15+55	0.8278	2.41	Q	V			
16+ 0	0.8530	3.66	Q	V			
16+ 5	0.9124	8.62		Q V			
16+10	1.0330	17.52		V	Q		
16+15	1.2126	26.07		V		Q	
16+20	1.4179	29.81		V		Q	
16+25	1.5892	24.87		V	Q		
16+30	1.7020	16.38		Q V			
16+35	1.7799	11.30		Q	V		
16+40	1.8385	8.51	Q		V		
16+45	1.8880	7.19	Q		V		
16+50	1.9306	6.19	Q		V		
16+55	1.9682	5.46	Q		V		
17+ 0	2.0012	4.79	Q		V		
17+ 5	2.0302	4.21	Q		V		
17+10	2.0571	3.91	Q		V		
17+15	2.0808	3.44	Q		V		
17+20	2.1025	3.15	Q		V		
17+25	2.1217	2.79	Q		V		
17+30	2.1397	2.62	Q		V		
17+35	2.1570	2.50	Q		V		
17+40	2.1734	2.38	Q		V		
17+45	2.1881	2.13	Q		V		
17+50	2.2019	2.01	Q		V		
17+55	2.2147	1.86	Q		V		
18+ 0	2.2268	1.77	Q		V		
18+ 5	2.2380	1.62	Q		V		
18+10	2.2485	1.53	Q		V		
18+15	2.2581	1.39	Q		V		
18+20	2.2672	1.33	Q		V		
18+25	2.2761	1.29	Q		V		
18+30	2.2847	1.25	Q		V		
18+35	2.2930	1.20	Q		V		
18+40	2.3005	1.10	Q		V		
18+45	2.3059	0.78	Q		V		
18+50	2.3110	0.75	Q		V		
18+55	2.3160	0.73	Q		V		
19+ 0	2.3209	0.71	Q		V		
19+ 5	2.3257	0.69	Q		V		
19+10	2.3303	0.68	Q		V		
19+15	2.3349	0.66	Q		V		
19+20	2.3393	0.65	Q		V		
19+25	2.3437	0.64	Q		V		
19+30	2.3480	0.62	Q		V		
19+35	2.3523	0.61	Q		V		
19+40	2.3564	0.60	Q		V		
19+45	2.3605	0.59	Q		V		
19+50	2.3645	0.58	Q		V		
19+55	2.3685	0.57	Q		V		
20+ 0	2.3724	0.57	Q		V		
20+ 5	2.3762	0.56	Q		V		
20+10	2.3800	0.55	Q		V		
20+15	2.3837	0.54	Q		V		
20+20	2.3874	0.53	Q		V		
20+25	2.3911	0.53	Q		V		
20+30	2.3946	0.52	Q		V		
20+35	2.3982	0.51	Q		V		
20+40	2.4017	0.51	Q		V		
20+45	2.4051	0.50	Q		V		
20+50	2.4086	0.50	Q		V		
20+55	2.4120	0.49	Q		V		
21+ 0	2.4153	0.49	Q		V		
21+ 5	2.4186	0.48	Q		V		
21+10	2.4219	0.48	Q		V		
21+15	2.4251	0.47	Q		V		
21+20	2.4283	0.47	Q		V		
21+25	2.4315	0.46	Q		V		
21+30	2.4347	0.46	Q		V		
21+35	2.4378	0.45	Q		V		

21+40	2.4409	0.45	Q	|	|	|	V |
21+45	2.4439	0.44	Q	|	|	|	V |
21+50	2.4470	0.44	Q	|	|	|	V |
21+55	2.4500	0.44	Q	|	|	|	V |
22+ 0	2.4529	0.43	Q	|	|	|	V |
22+ 5	2.4559	0.43	Q	|	|	|	V |
22+10	2.4588	0.42	Q	|	|	|	V |
22+15	2.4617	0.42	Q	|	|	|	V |
22+20	2.4646	0.42	Q	|	|	|	V |
22+25	2.4675	0.41	Q	|	|	|	V |
22+30	2.4703	0.41	Q	|	|	|	V|
22+35	2.4731	0.41	Q	|	|	|	V|
22+40	2.4759	0.40	Q	|	|	|	V|
22+45	2.4787	0.40	Q	|	|	|	V|
22+50	2.4814	0.40	Q	|	|	|	V|
22+55	2.4841	0.40	Q	|	|	|	V|
23+ 0	2.4868	0.39	Q	|	|	|	V|
23+ 5	2.4895	0.39	Q	|	|	|	V|
23+10	2.4922	0.39	Q	|	|	|	V|
23+15	2.4948	0.38	Q	|	|	|	V|
23+20	2.4975	0.38	Q	|	|	|	V|
23+25	2.5001	0.38	Q	|	|	|	V|
23+30	2.5027	0.38	Q	|	|	|	V|
23+35	2.5052	0.37	Q	|	|	|	V|
23+40	2.5078	0.37	Q	|	|	|	V|
23+45	2.5103	0.37	Q	|	|	|	V|
23+50	2.5128	0.37	Q	|	|	|	V|
23+55	2.5154	0.36	Q	|	|	|	V|
24+ 0	2.5178	0.36	Q	|	|	|	V|
24+ 5	2.5203	0.35	Q	|	|	|	V|
24+10	2.5225	0.32	Q	|	|	|	V|
24+15	2.5243	0.27	Q	|	|	|	V|
24+20	2.5258	0.21	Q	|	|	|	V|
24+25	2.5268	0.15	Q	|	|	|	V|
24+30	2.5277	0.12	Q	|	|	|	V|
24+35	2.5284	0.10	Q	|	|	|	V|
24+40	2.5289	0.08	Q	|	|	|	V|
24+45	2.5294	0.07	Q	|	|	|	V|
24+50	2.5299	0.06	Q	|	|	|	V|
24+55	2.5302	0.05	Q	|	|	|	V|
25+ 0	2.5306	0.05	Q	|	|	|	V|
25+ 5	2.5309	0.04	Q	|	|	|	V|
25+10	2.5311	0.04	Q	|	|	|	V|
25+15	2.5313	0.03	Q	|	|	|	V|
25+20	2.5315	0.03	Q	|	|	|	V|
25+25	2.5317	0.02	Q	|	|	|	V|
25+30	2.5318	0.02	Q	|	|	|	V|
25+35	2.5319	0.02	Q	|	|	|	V|
25+40	2.5320	0.02	Q	|	|	|	V|
25+45	2.5321	0.01	Q	|	|	|	V|
25+50	2.5322	0.01	Q	|	|	|	V|
25+55	2.5323	0.01	Q	|	|	|	V|
26+ 0	2.5323	0.01	Q	|	|	|	V|
26+ 5	2.5324	0.01	Q	|	|	|	V|
26+10	2.5324	0.01	Q	|	|	|	V|
26+15	2.5324	0.00	Q	|	|	|	V|
26+20	2.5325	0.00	Q	|	|	|	V|
26+25	2.5325	0.00	Q	|	|	|	V|
26+30	2.5325	0.00	Q	|	|	|	V|
26+35	2.5325	0.00	Q	|	|	|	V|

APPENDIX D: POST-PROJECT CONDITION UNIT HYDROGRAPH HYDROLOGY

APPENDIX D.1: UNIT HYDROGRAPH ANALYSIS, AREA "AB"

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

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Study date 03/05/18

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

Program License Serial Number 6279

BLOOMINGTON COMMERCE CENTER POST-PROJECT ONSITE HYDROLOGY
UNIT HYDROGRAPH ANALYSIS, 100-YEAR STORM EVENT'
FILENAME: ARAB

Storm Event Year = 100

Antecedent Moisture Condition = 2

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 100		
30.71	1	1.30
Rainfall data for year 100		
30.71	6	3.09
Rainfall data for year 100		
30.71	24	5.66

++

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

SCS curve No.(AMCII)	SCS curve NO.(AMC 2)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
32.0	32.0	30.71	1.000	0.978	0.216	0.211

Area-averaged adjusted loss rate Fm (In/Hr) = 0.211

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

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC2)	S	Pervious Yield Fr
6.63	0.216	32.0	32.0	21.25	0.016
24.08	0.784	98.0	98.0	0.20	0.958

Area-averaged catchment yield fraction, Y = 0.754
Area-averaged low loss fraction, Yb = 0.246
User entry of time of concentration = 0.316 (hours)
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Watershed area = 30.71(Ac.)
Catchment Lag time = 0.253 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 32.9955
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.211(In/Hr)
Average low loss rate fraction (Yb) = 0.246 (decimal)
VALLEY DEVELOPED S-Graph Selected
Computed peak 5-minute rainfall = 0.481(In)
Computed peak 30-minute rainfall = 0.985(In)
Specified peak 1-hour rainfall = 1.300(In)
Computed peak 3-hour rainfall = 2.211(In)
Specified peak 6-hour rainfall = 3.090(In)
Specified peak 24-hour rainfall = 5.660(In)

Rainfall depth area reduction factors:
Using a total area of 30.71(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999 Adjusted rainfall = 0.480(In)
30-minute factor = 0.999 Adjusted rainfall = 0.984(In)
1-hour factor = 0.999 Adjusted rainfall = 1.298(In)
3-hour factor = 1.000 Adjusted rainfall = 2.210(In)
6-hour factor = 1.000 Adjusted rainfall = 3.090(In)
24-hour factor = 1.000 Adjusted rainfall = 5.660(In)

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

Interval Number	'S' Graph Mean values (K = 371.40 (CFS))	Unit Hydrograph ((CFS))
1	2.235	8.302
2	13.437	41.601
3	34.905	79.734
4	62.952	104.166
5	81.777	69.917
6	91.510	36.146
7	96.266	17.665
8	98.212	7.226
9	98.848	2.365
10	99.442	2.205
11	100.000	2.072

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.4804	0.4804
2	0.6340	0.1535
3	0.7456	0.1116
4	0.8365	0.0909
5	0.9146	0.0781
6	0.9838	0.0692
7	1.0464	0.0626
8	1.1038	0.0574
9	1.1570	0.0532
10	1.2068	0.0498
11	1.2537	0.0469
12	1.2981	0.0444
13	1.3494	0.0513
14	1.3988	0.0493
15	1.4463	0.0475
16	1.4922	0.0459
17	1.5367	0.0445
18	1.5798	0.0431
19	1.6217	0.0419
20	1.6625	0.0408
21	1.7023	0.0398
22	1.7411	0.0388
23	1.7790	0.0379

24	1.8160	0.0371
25	1.8523	0.0363
26	1.8878	0.0355
27	1.9227	0.0348
28	1.9568	0.0342
29	1.9904	0.0335
30	2.0233	0.0330
31	2.0557	0.0324
32	2.0876	0.0319
33	2.1189	0.0313
34	2.1498	0.0309
35	2.1802	0.0304
36	2.2101	0.0300
37	2.2396	0.0295
38	2.2686	0.0291
39	2.2973	0.0287
40	2.3256	0.0283
41	2.3535	0.0279
42	2.3811	0.0276
43	2.4083	0.0272
44	2.4352	0.0269
45	2.4618	0.0266
46	2.4881	0.0263
47	2.5141	0.0260
48	2.5398	0.0257
49	2.5653	0.0254
50	2.5904	0.0252
51	2.6154	0.0249
52	2.6400	0.0247
53	2.6644	0.0244
54	2.6886	0.0242
55	2.7126	0.0240
56	2.7363	0.0237
57	2.7598	0.0235
58	2.7831	0.0233
59	2.8062	0.0231
60	2.8291	0.0229
61	2.8518	0.0227
62	2.8743	0.0225
63	2.8966	0.0223
64	2.9187	0.0221
65	2.9407	0.0220
66	2.9625	0.0218
67	2.9841	0.0216
68	3.0055	0.0214
69	3.0268	0.0213
70	3.0479	0.0211
71	3.0689	0.0210
72	3.0897	0.0208
73	3.1084	0.0187
74	3.1269	0.0185
75	3.1453	0.0184
76	3.1635	0.0182
77	3.1816	0.0181
78	3.1996	0.0180
79	3.2174	0.0178
80	3.2352	0.0177
81	3.2528	0.0176
82	3.2702	0.0175
83	3.2876	0.0174
84	3.3048	0.0172
85	3.3219	0.0171
86	3.3390	0.0170
87	3.3559	0.0169
88	3.3726	0.0168
89	3.3893	0.0167
90	3.4059	0.0166
91	3.4224	0.0165
92	3.4387	0.0164
93	3.4550	0.0163
94	3.4712	0.0162

95	3.4873	0.0161
96	3.5032	0.0160
97	3.5191	0.0159
98	3.5349	0.0158
99	3.5506	0.0157
100	3.5662	0.0156
101	3.5818	0.0155
102	3.5972	0.0154
103	3.6126	0.0154
104	3.6278	0.0153
105	3.6430	0.0152
106	3.6581	0.0151
107	3.6732	0.0150
108	3.6881	0.0149
109	3.7030	0.0149
110	3.7178	0.0148
111	3.7325	0.0147
112	3.7472	0.0146
113	3.7617	0.0146
114	3.7762	0.0145
115	3.7907	0.0144
116	3.8050	0.0144
117	3.8193	0.0143
118	3.8335	0.0142
119	3.8477	0.0142
120	3.8618	0.0141
121	3.8758	0.0140
122	3.8897	0.0140
123	3.9036	0.0139
124	3.9174	0.0138
125	3.9312	0.0138
126	3.9449	0.0137
127	3.9585	0.0136
128	3.9721	0.0136
129	3.9856	0.0135
130	3.9991	0.0135
131	4.0125	0.0134
132	4.0259	0.0133
133	4.0391	0.0133
134	4.0524	0.0132
135	4.0656	0.0132
136	4.0787	0.0131
137	4.0917	0.0131
138	4.1048	0.0130
139	4.1177	0.0130
140	4.1306	0.0129
141	4.1435	0.0129
142	4.1563	0.0128
143	4.1690	0.0128
144	4.1818	0.0127
145	4.1944	0.0127
146	4.2070	0.0126
147	4.2196	0.0126
148	4.2321	0.0125
149	4.2445	0.0125
150	4.2570	0.0124
151	4.2693	0.0124
152	4.2816	0.0123
153	4.2939	0.0123
154	4.3062	0.0122
155	4.3183	0.0122
156	4.3305	0.0121
157	4.3426	0.0121
158	4.3546	0.0121
159	4.3667	0.0120
160	4.3786	0.0120
161	4.3906	0.0119
162	4.4024	0.0119
163	4.4143	0.0118
164	4.4261	0.0118
165	4.4379	0.0118

166	4.4496	0.0117
167	4.4613	0.0117
168	4.4729	0.0116
169	4.4845	0.0116
170	4.4961	0.0116
171	4.5076	0.0115
172	4.5191	0.0115
173	4.5306	0.0115
174	4.5420	0.0114
175	4.5533	0.0114
176	4.5647	0.0113
177	4.5760	0.0113
178	4.5873	0.0113
179	4.5985	0.0112
180	4.6097	0.0112
181	4.6209	0.0112
182	4.6320	0.0111
183	4.6431	0.0111
184	4.6542	0.0111
185	4.6652	0.0110
186	4.6762	0.0110
187	4.6871	0.0110
188	4.6981	0.0109
189	4.7090	0.0109
190	4.7198	0.0109
191	4.7307	0.0108
192	4.7415	0.0108
193	4.7522	0.0108
194	4.7630	0.0107
195	4.7737	0.0107
196	4.7843	0.0107
197	4.7950	0.0106
198	4.8056	0.0106
199	4.8162	0.0106
200	4.8267	0.0106
201	4.8372	0.0105
202	4.8477	0.0105
203	4.8582	0.0105
204	4.8686	0.0104
205	4.8790	0.0104
206	4.8894	0.0104
207	4.8998	0.0103
208	4.9101	0.0103
209	4.9204	0.0103
210	4.9307	0.0103
211	4.9409	0.0102
212	4.9511	0.0102
213	4.9613	0.0102
214	4.9714	0.0102
215	4.9816	0.0101
216	4.9917	0.0101
217	5.0018	0.0101
218	5.0118	0.0101
219	5.0218	0.0100
220	5.0318	0.0100
221	5.0418	0.0100
222	5.0518	0.0099
223	5.0617	0.0099
224	5.0716	0.0099
225	5.0815	0.0099
226	5.0913	0.0098
227	5.1011	0.0098
228	5.1109	0.0098
229	5.1207	0.0098
230	5.1305	0.0098
231	5.1402	0.0097
232	5.1499	0.0097
233	5.1596	0.0097
234	5.1692	0.0097
235	5.1789	0.0096
236	5.1885	0.0096

237	5.1981	0.0096
238	5.2076	0.0096
239	5.2172	0.0095
240	5.2267	0.0095
241	5.2362	0.0095
242	5.2457	0.0095
243	5.2551	0.0095
244	5.2645	0.0094
245	5.2740	0.0094
246	5.2833	0.0094
247	5.2927	0.0094
248	5.3021	0.0093
249	5.3114	0.0093
250	5.3207	0.0093
251	5.3300	0.0093
252	5.3392	0.0093
253	5.3485	0.0092
254	5.3577	0.0092
255	5.3669	0.0092
256	5.3761	0.0092
257	5.3852	0.0092
258	5.3944	0.0091
259	5.4035	0.0091
260	5.4126	0.0091
261	5.4217	0.0091
262	5.4307	0.0091
263	5.4398	0.0090
264	5.4488	0.0090
265	5.4578	0.0090
266	5.4668	0.0090
267	5.4757	0.0090
268	5.4847	0.0089
269	5.4936	0.0089
270	5.5025	0.0089
271	5.5114	0.0089
272	5.5203	0.0089
273	5.5291	0.0089
274	5.5380	0.0088
275	5.5468	0.0088
276	5.5556	0.0088
277	5.5644	0.0088
278	5.5731	0.0088
279	5.5819	0.0087
280	5.5906	0.0087
281	5.5993	0.0087
282	5.6080	0.0087
283	5.6167	0.0087
284	5.6253	0.0087
285	5.6340	0.0086
286	5.6426	0.0086
287	5.6512	0.0086
288	5.6598	0.0086

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0086	0.0021	0.0065
2	0.0086	0.0021	0.0065
3	0.0086	0.0021	0.0065
4	0.0087	0.0021	0.0065
5	0.0087	0.0021	0.0066
6	0.0087	0.0021	0.0066
7	0.0087	0.0021	0.0066
8	0.0088	0.0022	0.0066
9	0.0088	0.0022	0.0066
10	0.0088	0.0022	0.0067
11	0.0089	0.0022	0.0067
12	0.0089	0.0022	0.0067
13	0.0089	0.0022	0.0067
14	0.0089	0.0022	0.0067

15	0.0090	0.0022	0.0068
16	0.0090	0.0022	0.0068
17	0.0090	0.0022	0.0068
18	0.0090	0.0022	0.0068
19	0.0091	0.0022	0.0069
20	0.0091	0.0022	0.0069
21	0.0091	0.0022	0.0069
22	0.0092	0.0022	0.0069
23	0.0092	0.0023	0.0069
24	0.0092	0.0023	0.0070
25	0.0093	0.0023	0.0070
26	0.0093	0.0023	0.0070
27	0.0093	0.0023	0.0070
28	0.0093	0.0023	0.0071
29	0.0094	0.0023	0.0071
30	0.0094	0.0023	0.0071
31	0.0095	0.0023	0.0071
32	0.0095	0.0023	0.0071
33	0.0095	0.0023	0.0072
34	0.0095	0.0023	0.0072
35	0.0096	0.0024	0.0072
36	0.0096	0.0024	0.0073
37	0.0097	0.0024	0.0073
38	0.0097	0.0024	0.0073
39	0.0097	0.0024	0.0073
40	0.0098	0.0024	0.0074
41	0.0098	0.0024	0.0074
42	0.0098	0.0024	0.0074
43	0.0099	0.0024	0.0074
44	0.0099	0.0024	0.0075
45	0.0099	0.0024	0.0075
46	0.0100	0.0024	0.0075
47	0.0100	0.0025	0.0076
48	0.0101	0.0025	0.0076
49	0.0101	0.0025	0.0076
50	0.0101	0.0025	0.0076
51	0.0102	0.0025	0.0077
52	0.0102	0.0025	0.0077
53	0.0103	0.0025	0.0077
54	0.0103	0.0025	0.0078
55	0.0103	0.0025	0.0078
56	0.0104	0.0025	0.0078
57	0.0104	0.0026	0.0079
58	0.0105	0.0026	0.0079
59	0.0105	0.0026	0.0079
60	0.0106	0.0026	0.0080
61	0.0106	0.0026	0.0080
62	0.0106	0.0026	0.0080
63	0.0107	0.0026	0.0081
64	0.0107	0.0026	0.0081
65	0.0108	0.0027	0.0081
66	0.0108	0.0027	0.0082
67	0.0109	0.0027	0.0082
68	0.0109	0.0027	0.0082
69	0.0110	0.0027	0.0083
70	0.0110	0.0027	0.0083
71	0.0111	0.0027	0.0084
72	0.0111	0.0027	0.0084
73	0.0112	0.0028	0.0084
74	0.0112	0.0028	0.0085
75	0.0113	0.0028	0.0085
76	0.0113	0.0028	0.0086
77	0.0114	0.0028	0.0086
78	0.0115	0.0028	0.0086
79	0.0115	0.0028	0.0087
80	0.0116	0.0028	0.0087
81	0.0116	0.0029	0.0088
82	0.0117	0.0029	0.0088
83	0.0118	0.0029	0.0089
84	0.0118	0.0029	0.0089
85	0.0119	0.0029	0.0090

86	0.0119	0.0029	0.0090
87	0.0120	0.0030	0.0091
88	0.0121	0.0030	0.0091
89	0.0121	0.0030	0.0092
90	0.0122	0.0030	0.0092
91	0.0123	0.0030	0.0093
92	0.0123	0.0030	0.0093
93	0.0124	0.0030	0.0094
94	0.0125	0.0031	0.0094
95	0.0126	0.0031	0.0095
96	0.0126	0.0031	0.0095
97	0.0127	0.0031	0.0096
98	0.0128	0.0031	0.0096
99	0.0129	0.0032	0.0097
100	0.0129	0.0032	0.0097
101	0.0130	0.0032	0.0098
102	0.0131	0.0032	0.0099
103	0.0132	0.0032	0.0099
104	0.0132	0.0032	0.0100
105	0.0133	0.0033	0.0101
106	0.0134	0.0033	0.0101
107	0.0135	0.0033	0.0102
108	0.0136	0.0033	0.0102
109	0.0137	0.0034	0.0103
110	0.0138	0.0034	0.0104
111	0.0139	0.0034	0.0105
112	0.0140	0.0034	0.0105
113	0.0141	0.0035	0.0106
114	0.0142	0.0035	0.0107
115	0.0143	0.0035	0.0108
116	0.0144	0.0035	0.0108
117	0.0145	0.0036	0.0109
118	0.0146	0.0036	0.0110
119	0.0147	0.0036	0.0111
120	0.0148	0.0036	0.0112
121	0.0149	0.0037	0.0113
122	0.0150	0.0037	0.0113
123	0.0152	0.0037	0.0115
124	0.0153	0.0038	0.0115
125	0.0154	0.0038	0.0116
126	0.0155	0.0038	0.0117
127	0.0157	0.0039	0.0118
128	0.0158	0.0039	0.0119
129	0.0160	0.0039	0.0121
130	0.0161	0.0039	0.0121
131	0.0163	0.0040	0.0123
132	0.0164	0.0040	0.0124
133	0.0166	0.0041	0.0125
134	0.0167	0.0041	0.0126
135	0.0169	0.0041	0.0127
136	0.0170	0.0042	0.0128
137	0.0172	0.0042	0.0130
138	0.0174	0.0043	0.0131
139	0.0176	0.0043	0.0133
140	0.0177	0.0044	0.0134
141	0.0180	0.0044	0.0136
142	0.0181	0.0044	0.0137
143	0.0184	0.0045	0.0139
144	0.0185	0.0045	0.0140
145	0.0208	0.0051	0.0157
146	0.0210	0.0051	0.0158
147	0.0213	0.0052	0.0161
148	0.0214	0.0053	0.0162
149	0.0218	0.0053	0.0164
150	0.0220	0.0054	0.0166
151	0.0223	0.0055	0.0168
152	0.0225	0.0055	0.0170
153	0.0229	0.0056	0.0173
154	0.0231	0.0057	0.0174
155	0.0235	0.0058	0.0177
156	0.0237	0.0058	0.0179

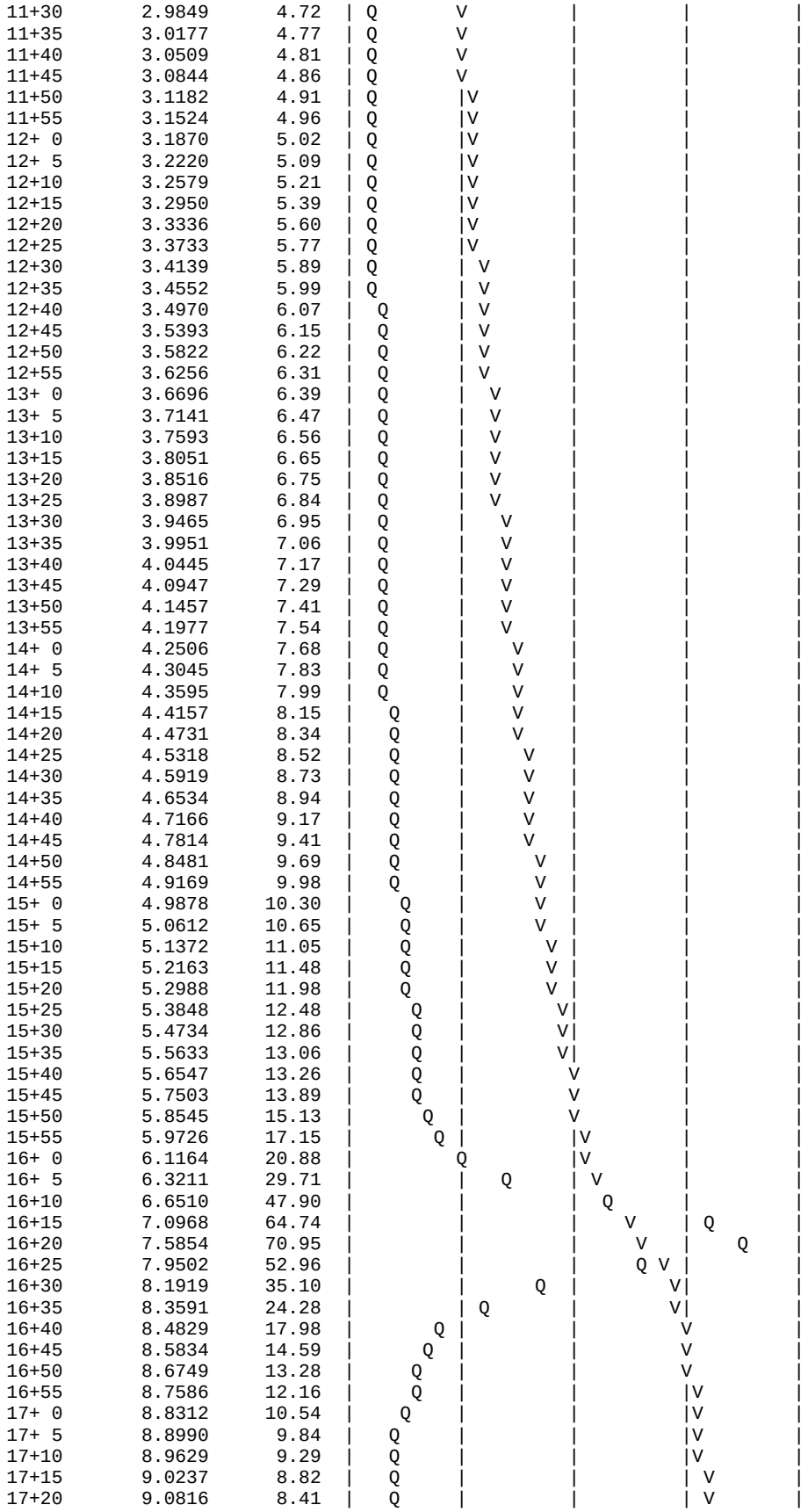
157	0.0242	0.0059	0.0182
158	0.0244	0.0060	0.0184
159	0.0249	0.0061	0.0188
160	0.0252	0.0062	0.0190
161	0.0257	0.0063	0.0194
162	0.0260	0.0064	0.0196
163	0.0266	0.0065	0.0201
164	0.0269	0.0066	0.0203
165	0.0276	0.0068	0.0208
166	0.0279	0.0069	0.0211
167	0.0287	0.0070	0.0216
168	0.0291	0.0071	0.0219
169	0.0300	0.0074	0.0226
170	0.0304	0.0075	0.0229
171	0.0313	0.0077	0.0236
172	0.0319	0.0078	0.0240
173	0.0330	0.0081	0.0249
174	0.0335	0.0082	0.0253
175	0.0348	0.0086	0.0263
176	0.0355	0.0087	0.0268
177	0.0371	0.0091	0.0280
178	0.0379	0.0093	0.0286
179	0.0398	0.0098	0.0300
180	0.0408	0.0100	0.0308
181	0.0431	0.0106	0.0325
182	0.0445	0.0109	0.0335
183	0.0475	0.0117	0.0359
184	0.0493	0.0121	0.0372
185	0.0444	0.0109	0.0335
186	0.0469	0.0115	0.0354
187	0.0532	0.0131	0.0402
188	0.0574	0.0141	0.0433
189	0.0692	0.0170	0.0522
190	0.0781	0.0176	0.0605
191	0.1116	0.0176	0.0940
192	0.1535	0.0176	0.1359
193	0.4804	0.0176	0.4628
194	0.0909	0.0176	0.0733
195	0.0626	0.0154	0.0472
196	0.0498	0.0122	0.0376
197	0.0513	0.0126	0.0387
198	0.0459	0.0113	0.0346
199	0.0419	0.0103	0.0316
200	0.0388	0.0095	0.0293
201	0.0363	0.0089	0.0274
202	0.0342	0.0084	0.0258
203	0.0324	0.0080	0.0244
204	0.0309	0.0076	0.0233
205	0.0295	0.0072	0.0222
206	0.0283	0.0069	0.0213
207	0.0272	0.0067	0.0205
208	0.0263	0.0065	0.0198
209	0.0254	0.0062	0.0192
210	0.0247	0.0061	0.0186
211	0.0240	0.0059	0.0181
212	0.0233	0.0057	0.0176
213	0.0227	0.0056	0.0171
214	0.0221	0.0054	0.0167
215	0.0216	0.0053	0.0163
216	0.0211	0.0052	0.0159
217	0.0187	0.0046	0.0141
218	0.0182	0.0045	0.0138
219	0.0178	0.0044	0.0135
220	0.0175	0.0043	0.0132
221	0.0171	0.0042	0.0129
222	0.0168	0.0041	0.0127
223	0.0165	0.0040	0.0124
224	0.0162	0.0040	0.0122
225	0.0159	0.0039	0.0120
226	0.0156	0.0038	0.0118
227	0.0154	0.0038	0.0116

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228              0.0151          0.0037              0.0114
229              0.0149          0.0037              0.0112
230              0.0146          0.0036              0.0110
231              0.0144          0.0035              0.0109
232              0.0142          0.0035              0.0107
233              0.0140          0.0034              0.0106
234              0.0138          0.0034              0.0104
235              0.0136          0.0033              0.0103
236              0.0135          0.0033              0.0102
237              0.0133          0.0033              0.0100
238              0.0131          0.0032              0.0099
239              0.0130          0.0032              0.0098
240              0.0128          0.0031              0.0097
241              0.0127          0.0031              0.0095
242              0.0125          0.0031              0.0094
243              0.0124          0.0030              0.0093
244              0.0122          0.0030              0.0092
245              0.0121          0.0030              0.0091
246              0.0120          0.0029              0.0090
247              0.0118          0.0029              0.0089
248              0.0117          0.0029              0.0088
249              0.0116          0.0029              0.0088
250              0.0115          0.0028              0.0087
251              0.0114          0.0028              0.0086
252              0.0113          0.0028              0.0085
253              0.0112          0.0027              0.0084
254              0.0111          0.0027              0.0083
255              0.0110          0.0027              0.0083
256              0.0109          0.0027              0.0082
257              0.0108          0.0026              0.0081
258              0.0107          0.0026              0.0081
259              0.0106          0.0026              0.0080
260              0.0105          0.0026              0.0079
261              0.0104          0.0026              0.0079
262              0.0103          0.0025              0.0078
263              0.0102          0.0025              0.0077
264              0.0102          0.0025              0.0077
265              0.0101          0.0025              0.0076
266              0.0100          0.0025              0.0075
267              0.0099          0.0024              0.0075
268              0.0098          0.0024              0.0074
269              0.0098          0.0024              0.0074
270              0.0097          0.0024              0.0073
271              0.0096          0.0024              0.0073
272              0.0096          0.0023              0.0072
273              0.0095          0.0023              0.0072
274              0.0094          0.0023              0.0071
275              0.0094          0.0023              0.0071
276              0.0093          0.0023              0.0070
277              0.0092          0.0023              0.0070
278              0.0092          0.0023              0.0069
279              0.0091          0.0022              0.0069
280              0.0091          0.0022              0.0068
281              0.0090          0.0022              0.0068
282              0.0089          0.0022              0.0067
283              0.0089          0.0022              0.0067
284              0.0088          0.0022              0.0067
285              0.0088          0.0022              0.0066
286              0.0087          0.0021              0.0066
287              0.0087          0.0021              0.0065
288              0.0086          0.0021              0.0065
------------------------------------------------------------------
------------------------------------------------------------------
Total soil rain loss =      1.25(In)
Total effective rainfall =      4.41(In)
Peak flow rate in flood hydrograph =     70.95(CFS)
------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                  24 - H O U R    S T O R M
              R u n o f f      H y d r o g r a p h
------------------------------------------------------------------
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Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	20.0	40.0	60.0	80.0
0+ 5	0.0004	0.05	Q				
0+10	0.0026	0.32	Q				
0+15	0.0084	0.84	Q				
0+20	0.0188	1.52	Q				
0+25	0.0324	1.98	Q				
0+30	0.0477	2.22	VQ				
0+35	0.0638	2.34	VQ				
0+40	0.0803	2.39	VQ				
0+45	0.0969	2.41	VQ				
0+50	0.1136	2.43	VQ				
0+55	0.1305	2.45	VQ				
1+ 0	0.1475	2.46	VQ				
1+ 5	0.1645	2.47	VQ				
1+10	0.1816	2.48	VQ				
1+15	0.1987	2.49	VQ				
1+20	0.2159	2.49	VQ				
1+25	0.2331	2.50	VQ				
1+30	0.2504	2.51	VQ				
1+35	0.2677	2.52	VQ				
1+40	0.2851	2.52	|Q				
1+45	0.3025	2.53	|Q				
1+50	0.3200	2.54	|Q				
1+55	0.3376	2.55	|Q				
2+ 0	0.3552	2.56	|Q				
2+ 5	0.3729	2.57	|Q				
2+10	0.3906	2.57	|Q				
2+15	0.4084	2.58	|Q				
2+20	0.4263	2.59	|Q				
2+25	0.4442	2.60	|Q				
2+30	0.4621	2.61	|Q				
2+35	0.4802	2.62	|Q				
2+40	0.4983	2.63	|Q				
2+45	0.5164	2.64	|Q				
2+50	0.5346	2.65	|Q				
2+55	0.5529	2.65	|Q				
3+ 0	0.5713	2.66	|QV				
3+ 5	0.5897	2.67	|QV				
3+10	0.6082	2.68	|QV				
3+15	0.6267	2.69	|QV				
3+20	0.6453	2.70	|QV				
3+25	0.6640	2.71	|QV				
3+30	0.6827	2.72	|QV				
3+35	0.7016	2.73	|QV				
3+40	0.7204	2.74	|QV				
3+45	0.7394	2.75	|QV				
3+50	0.7584	2.76	|QV				
3+55	0.7775	2.77	|QV				
4+ 0	0.7967	2.78	|QV				
4+ 5	0.8159	2.79	|QV				
4+10	0.8353	2.81	|QV				
4+15	0.8547	2.82	|Q V				
4+20	0.8741	2.83	|Q V				
4+25	0.8937	2.84	|Q V				
4+30	0.9133	2.85	|Q V				
4+35	0.9330	2.86	|Q V				
4+40	0.9528	2.87	|Q V				
4+45	0.9726	2.88	|Q V				
4+50	0.9926	2.90	|Q V				
4+55	1.0126	2.91	|Q V				
5+ 0	1.0327	2.92	|Q V				
5+ 5	1.0529	2.93	|Q V				
5+10	1.0732	2.94	|Q V				
5+15	1.0935	2.96	|Q V				
5+20	1.1140	2.97	|Q V				
5+25	1.1345	2.98	|Q V				
5+30	1.1552	2.99	|Q V				

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 5+35       1.1759      3.01  |Q  V     |         |         |         |
 5+40       1.1967      3.02  |Q  V     |         |         |         |
 5+45       1.2176      3.03  |Q  V     |         |         |         |
 5+50       1.2386      3.05  |Q  V     |         |         |         |
 5+55       1.2596      3.06  |Q  V     |         |         |         |
 6+ 0       1.2808      3.08  |Q  V     |         |         |         |
 6+ 5       1.3021      3.09  |Q  V     |         |         |         |
 6+10       1.3235      3.10  |Q  V     |         |         |         |
 6+15       1.3450      3.12  |Q  V     |         |         |         |
 6+20       1.3665      3.13  |Q  V     |         |         |         |
 6+25       1.3882      3.15  |Q  V     |         |         |         |
 6+30       1.4100      3.16  |Q   V    |         |         |         |
 6+35       1.4319      3.18  |Q   V    |         |         |         |
 6+40       1.4539      3.19  |Q   V    |         |         |         |
 6+45       1.4760      3.21  |Q   V    |         |         |         |
 6+50       1.4982      3.22  |Q   V    |         |         |         |
 6+55       1.5205      3.24  |Q   V    |         |         |         |
 7+ 0       1.5429      3.26  |Q   V    |         |         |         |
 7+ 5       1.5655      3.27  |Q   V    |         |         |         |
 7+10       1.5881      3.29  |Q   V    |         |         |         |
 7+15       1.6109      3.31  |Q   V    |         |         |         |
 7+20       1.6338      3.32  |Q   V    |         |         |         |
 7+25       1.6568      3.34  |Q   V    |         |         |         |
 7+30       1.6800      3.36  |Q   V    |         |         |         |
 7+35       1.7032      3.38  |Q    V   |         |         |         |
 7+40       1.7266      3.40  |Q    V   |         |         |         |
 7+45       1.7501      3.41  |Q    V   |         |         |         |
 7+50       1.7738      3.43  |Q    V   |         |         |         |
 7+55       1.7975      3.45  |Q    V   |         |         |         |
 8+ 0       1.8215      3.47  |Q    V   |         |         |         |
 8+ 5       1.8455      3.49  |Q    V   |         |         |         |
 8+10       1.8697      3.51  |Q    V   |         |         |         |
 8+15       1.8940      3.53  |Q    V   |         |         |         |
 8+20       1.9185      3.55  |Q    V   |         |         |         |
 8+25       1.9431      3.57  |Q    V   |         |         |         |
 8+30       1.9678      3.59  |Q    V   |         |         |         |
 8+35       1.9927      3.62  |Q     V  |         |         |         |
 8+40       2.0178      3.64  |Q     V  |         |         |         |
 8+45       2.0430      3.66  |Q     V  |         |         |         |
 8+50       2.0684      3.68  |Q     V  |         |         |         |
 8+55       2.0939      3.71  |Q     V  |         |         |         |
 9+ 0       2.1196      3.73  |Q     V  |         |         |         |
 9+ 5       2.1455      3.75  |Q     V  |         |         |         |
 9+10       2.1715      3.78  |Q     V  |         |         |         |
 9+15       2.1977      3.80  |Q     V  |         |         |         |
 9+20       2.2241      3.83  |Q     V  |         |         |         |
 9+25       2.2507      3.86  |Q     V  |         |         |         |
 9+30       2.2774      3.88  |Q      V |         |         |         |
 9+35       2.3043      3.91  |Q      V |         |         |         |
 9+40       2.3314      3.94  |Q      V |         |         |         |
 9+45       2.3587      3.96  |Q      V |         |         |         |
 9+50       2.3862      3.99  |Q      V |         |         |         |
 9+55       2.4139      4.02  | Q     V |         |         |         |
10+ 0       2.4418      4.05  | Q     V |         |         |         |
10+ 5       2.4700      4.08  | Q     V |         |         |         |
10+10       2.4983      4.11  | Q     V |         |         |         |
10+15       2.5268      4.15  | Q     V |         |         |         |
10+20       2.5556      4.18  | Q      V|         |         |         |
10+25       2.5846      4.21  | Q      V|         |         |         |
10+30       2.6138      4.24  | Q      V|         |         |         |
10+35       2.6433      4.28  | Q      V|         |         |         |
10+40       2.6730      4.31  | Q      V|         |         |         |
10+45       2.7030      4.35  | Q      V|         |         |         |
10+50       2.7332      4.39  | Q      V|         |         |         |
10+55       2.7637      4.43  | Q      V|         |         |         |
11+ 0       2.7944      4.46  | Q      V|         |         |         |
11+ 5       2.8255      4.50  | Q       V         |         |         |
11+10       2.8568      4.55  | Q       V         |         |         |
11+15       2.8883      4.59  | Q       V         |         |         |
11+20       2.9202      4.63  | Q       V         |         |         |
11+25       2.9524      4.67  | Q       V         |         |         |
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11+30	2.9849	4.72	
11+35	3.0177	4.77	
11+40	3.0509	4.81	
11+45	3.0844	4.86	
11+50	3.1182	4.91	
11+55	3.1524	4.96	
12+ 0	3.1870	5.02	
12+ 5	3.2220	5.09	
12+10	3.2579	5.21	
12+15	3.2950	5.39	
12+20	3.3336	5.60	
12+25	3.3733	5.77	
12+30	3.4139	5.89	
12+35	3.4552	5.99	
12+40	3.4970	6.07	
12+45	3.5393	6.15	
12+50	3.5822	6.22	
12+55	3.6256	6.31	
13+ 0	3.6696	6.39	
13+ 5	3.7141	6.47	
13+10	3.7593	6.56	
13+15	3.8051	6.65	
13+20	3.8516	6.75	
13+25	3.8987	6.84	
13+30	3.9465	6.95	
13+35	3.9951	7.06	
13+40	4.0445	7.17	
13+45	4.0947	7.29	
13+50	4.1457	7.41	
13+55	4.1977	7.54	
14+ 0	4.2506	7.68	
14+ 5	4.3045	7.83	
14+10	4.3595	7.99	
14+15	4.4157	8.15	
14+20	4.4731	8.34	
14+25	4.5318	8.52	
14+30	4.5919	8.73	
14+35	4.6534	8.94	
14+40	4.7166	9.17	
14+45	4.7814	9.41	
14+50	4.8481	9.69	
14+55	4.9169	9.98	
15+ 0	4.9878	10.30	
15+ 5	5.0612	10.65	
15+10	5.1372	11.05	
15+15	5.2163	11.48	
15+20	5.2988	11.98	
15+25	5.3848	12.48	
15+30	5.4734	12.86	
15+35	5.5633	13.06	
15+40	5.6547	13.26	
15+45	5.7503	13.89	
15+50	5.8545	15.13	
15+55	5.9726	17.15	
16+ 0	6.1164	20.88	
16+ 5	6.3211	29.71	
16+10	6.6510	47.90	
16+15	7.0968	64.74	
16+20	7.5854	70.95	
16+25	7.9502	52.96	
16+30	8.1919	35.10	
16+35	8.3591	24.28	
16+40	8.4829	17.98	
16+45	8.5834	14.59	
16+50	8.6749	13.28	
16+55	8.7586	12.16	
17+ 0	8.8312	10.54	
17+ 5	8.8990	9.84	
17+10	8.9629	9.29	
17+15	9.0237	8.82	
17+20	9.0816	8.41	

17+25	9.1371	8.05	| Q	|	|	| V	|
17+30	9.1904	7.74	| Q	|	|	| V	|
17+35	9.2418	7.46	| Q	|	|	| V	|
17+40	9.2914	7.21	| Q	|	|	| V	|
17+45	9.3395	6.98	| Q	|	|	| V	|
17+50	9.3862	6.78	| Q	|	|	| V	|
17+55	9.4315	6.59	| Q	|	|	| V	|
18+ 0	9.4757	6.41	| Q	|	|	| V	|
18+ 5	9.5186	6.24	| Q	|	|	| V	|
18+10	9.5601	6.02	| Q	|	|	| V	|
18+15	9.5998	5.76	| Q	|	|	| V	|
18+20	9.6375	5.48	| Q	|	|	| V	|
18+25	9.6737	5.25	| Q	|	|	| V	|
18+30	9.7087	5.08	| Q	|	|	| V	|
18+35	9.7427	4.95	| Q	|	|	| V	|
18+40	9.7760	4.84	| Q	|	|	| V	|
18+45	9.8087	4.74	| Q	|	|	| V	|
18+50	9.8406	4.64	| Q	|	|	| V	|
18+55	9.8720	4.55	| Q	|	|	| V	|
19+ 0	9.9028	4.47	| Q	|	|	| V	|
19+ 5	9.9331	4.40	| Q	|	|	| V	|
19+10	9.9628	4.32	| Q	|	|	| V	|
19+15	9.9921	4.25	| Q	|	|	| V	|
19+20	10.0209	4.18	| Q	|	|	| V	|
19+25	10.0493	4.12	| Q	|	|	| V	|
19+30	10.0773	4.06	| Q	|	|	| V	|
19+35	10.1048	4.00	|Q	|	|	| V	|
19+40	10.1320	3.94	|Q	|	|	| V	|
19+45	10.1587	3.89	|Q	|	|	| V	|
19+50	10.1851	3.84	|Q	|	|	| V	|
19+55	10.2112	3.78	|Q	|	|	| V	|
20+ 0	10.2369	3.74	|Q	|	|	| V	|
20+ 5	10.2623	3.69	|Q	|	|	| V	|
20+10	10.2874	3.64	|Q	|	|	| V	|
20+15	10.3122	3.60	|Q	|	|	| V	|
20+20	10.3367	3.56	|Q	|	|	| V	|
20+25	10.3609	3.52	|Q	|	|	| V	|
20+30	10.3848	3.48	|Q	|	|	| V	|
20+35	10.4085	3.44	|Q	|	|	| V	|
20+40	10.4319	3.40	|Q	|	|	| V	|
20+45	10.4551	3.36	|Q	|	|	| V	|
20+50	10.4780	3.33	|Q	|	|	| V	|
20+55	10.5007	3.29	|Q	|	|	| V	|
21+ 0	10.5231	3.26	|Q	|	|	| V	|
21+ 5	10.5454	3.23	|Q	|	|	| V	|
21+10	10.5674	3.20	|Q	|	|	| V	|
21+15	10.5892	3.17	|Q	|	|	| V	|
21+20	10.6108	3.14	|Q	|	|	| V	|
21+25	10.6322	3.11	|Q	|	|	| V	|
21+30	10.6534	3.08	|Q	|	|	| V	|
21+35	10.6744	3.05	|Q	|	|	| V	|
21+40	10.6952	3.02	|Q	|	|	| V	|
21+45	10.7158	3.00	|Q	|	|	| V	|
21+50	10.7363	2.97	|Q	|	|	| V	|
21+55	10.7566	2.95	|Q	|	|	| V	|
22+ 0	10.7767	2.92	|Q	|	|	| V	|
22+ 5	10.7966	2.90	|Q	|	|	| V	|
22+10	10.8164	2.87	|Q	|	|	| V	|
22+15	10.8361	2.85	|Q	|	|	| V	|
22+20	10.8556	2.83	|Q	|	|	| V	|
22+25	10.8749	2.81	|Q	|	|	| V	|
22+30	10.8941	2.79	|Q	|	|	| V	|
22+35	10.9131	2.76	|Q	|	|	| V	|
22+40	10.9320	2.74	|Q	|	|	| V	|
22+45	10.9508	2.72	|Q	|	|	| V	|
22+50	10.9694	2.70	|Q	|	|	| V	|
22+55	10.9879	2.68	|Q	|	|	| V	|
23+ 0	11.0062	2.67	|Q	|	|	| V	|
23+ 5	11.0245	2.65	|Q	|	|	| V	|
23+10	11.0426	2.63	|Q	|	|	| V	|
23+15	11.0605	2.61	|Q	|	|	| V	|

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   23+20      11.0784      2.59  |Q        |         |         |        V|
   23+25      11.0961      2.58  |Q        |         |         |        V|
   23+30      11.1138      2.56  |Q        |         |         |        V|
   23+35      11.1313      2.54  |Q        |         |         |        V|
   23+40      11.1487      2.53  |Q        |         |         |        V|
   23+45      11.1660      2.51  |Q        |         |         |        V|
   23+50      11.1831      2.49  |Q        |         |         |        V|
   23+55      11.2002      2.48  |Q        |         |         |        V|
   24+ 0      11.2172      2.46  |Q        |         |         |        V|
   24+ 5      11.2337      2.39  |Q        |         |         |        V|
   24+10      11.2482      2.11  |Q        |         |         |        V|
   24+15      11.2591      1.58  Q         |         |         |        V|
   24+20      11.2653      0.90  Q         |         |         |        V|
   24+25      11.2684      0.44  Q         |         |         |        V|
   24+30      11.2698      0.21  Q         |         |         |        V|
   24+35      11.2704      0.09  Q         |         |         |        V|
   24+40      11.2707      0.04  Q         |         |         |        V|
   24+45      11.2709      0.03  Q         |         |         |        V|
   24+50      11.2710      0.01  Q         |         |         |        V|
-------------------------------------------------------------------------
```

APPENDIX D.2: UNIT HYDROGRAPH ANALYSIS, AREA "CD"

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

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Study date 03/02/18

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

Program License Serial Number 6279

BLOOMINGTON COMMERCE CENTER POST-PROJECT CONDITION ONSITE HYDROLOGY
UNIT HYDROGRAPH ANALYSIS, 100-YEAR STORM EVENT
FILENAME: ARCD

Storm Event Year = 100

Antecedent Moisture Condition = 2

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 100		
25.93	1	1.30
Rainfall data for year 100		
25.93	6	3.09
Rainfall data for year 100		
25.93	24	5.66

++

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

SCS curve No.(AMCII)	SCS curve NO.(AMC 2)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
32.0	32.0	25.93	1.000	0.978	0.114	0.111

Area-averaged adjusted loss rate Fm (In/Hr) = 0.111

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

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC2)	S	Pervious Yield Fr
2.96	0.114	32.0	32.0	21.25	0.016
22.97	0.886	98.0	98.0	0.20	0.958

Area-averaged catchment yield fraction, Y = 0.851
Area-averaged low loss fraction, Yb = 0.149
User entry of time of concentration = 0.205 (hours)

++

Watershed area = 25.93(Ac.)
Catchment Lag time = 0.164 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 50.9123
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.111(In/Hr)
Average low loss rate fraction (Yb) = 0.149 (decimal)
VALLEY DEVELOPED S-Graph Selected
Computed peak 5-minute rainfall = 0.481(In)
Computed peak 30-minute rainfall = 0.985(In)
Specified peak 1-hour rainfall = 1.300(In)
Computed peak 3-hour rainfall = 2.211(In)
Specified peak 6-hour rainfall = 3.090(In)
Specified peak 24-hour rainfall = 5.660(In)

Rainfall depth area reduction factors:
Using a total area of 25.93(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999 Adjusted rainfall = 0.481(In)
30-minute factor = 0.999 Adjusted rainfall = 0.984(In)
1-hour factor = 0.999 Adjusted rainfall = 1.298(In)
3-hour factor = 1.000 Adjusted rainfall = 2.210(In)
6-hour factor = 1.000 Adjusted rainfall = 3.090(In)
24-hour factor = 1.000 Adjusted rainfall = 5.660(In)

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

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 313.59 (CFS))	
1	4.738	14.859
2	30.840	81.852
3	70.215	123.476
4	90.664	64.126
5	97.277	20.739
6	98.840	4.902
7	100.000	3.637

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.4806	0.4806
2	0.6341	0.1535
3	0.7457	0.1117
4	0.8367	0.0909
5	0.9148	0.0781
6	0.9840	0.0692
7	1.0466	0.0626
8	1.1040	0.0574
9	1.1573	0.0533
10	1.2071	0.0498
11	1.2540	0.0469
12	1.2984	0.0444
13	1.3497	0.0513
14	1.3990	0.0493
15	1.4466	0.0475
16	1.4925	0.0459
17	1.5369	0.0445
18	1.5801	0.0431
19	1.6220	0.0419
20	1.6628	0.0408
21	1.7025	0.0397
22	1.7413	0.0388
23	1.7792	0.0379
24	1.8162	0.0370
25	1.8525	0.0363
26	1.8880	0.0355
27	1.9228	0.0348

28	1.9570	0.0342
29	1.9905	0.0335
30	2.0234	0.0329
31	2.0558	0.0324
32	2.0877	0.0318
33	2.1190	0.0313
34	2.1499	0.0309
35	2.1802	0.0304
36	2.2102	0.0299
37	2.2397	0.0295
38	2.2687	0.0291
39	2.2974	0.0287
40	2.3257	0.0283
41	2.3536	0.0279
42	2.3811	0.0276
43	2.4084	0.0272
44	2.4353	0.0269
45	2.4619	0.0266
46	2.4882	0.0263
47	2.5142	0.0260
48	2.5399	0.0257
49	2.5653	0.0254
50	2.5905	0.0252
51	2.6154	0.0249
52	2.6401	0.0247
53	2.6645	0.0244
54	2.6887	0.0242
55	2.7126	0.0240
56	2.7363	0.0237
57	2.7599	0.0235
58	2.7832	0.0233
59	2.8062	0.0231
60	2.8291	0.0229
61	2.8518	0.0227
62	2.8743	0.0225
63	2.8966	0.0223
64	2.9188	0.0221
65	2.9407	0.0220
66	2.9625	0.0218
67	2.9841	0.0216
68	3.0056	0.0214
69	3.0268	0.0213
70	3.0480	0.0211
71	3.0689	0.0210
72	3.0897	0.0208
73	3.1084	0.0187
74	3.1269	0.0185
75	3.1453	0.0184
76	3.1636	0.0182
77	3.1817	0.0181
78	3.1996	0.0180
79	3.2175	0.0178
80	3.2352	0.0177
81	3.2528	0.0176
82	3.2703	0.0175
83	3.2876	0.0174
84	3.3049	0.0172
85	3.3220	0.0171
86	3.3390	0.0170
87	3.3559	0.0169
88	3.3727	0.0168
89	3.3894	0.0167
90	3.4059	0.0166
91	3.4224	0.0165
92	3.4388	0.0164
93	3.4551	0.0163
94	3.4712	0.0162
95	3.4873	0.0161
96	3.5033	0.0160
97	3.5192	0.0159
98	3.5350	0.0158

99	3.5507	0.0157
100	3.5663	0.0156
101	3.5818	0.0155
102	3.5973	0.0154
103	3.6126	0.0154
104	3.6279	0.0153
105	3.6431	0.0152
106	3.6582	0.0151
107	3.6732	0.0150
108	3.6882	0.0149
109	3.7030	0.0149
110	3.7178	0.0148
111	3.7326	0.0147
112	3.7472	0.0146
113	3.7618	0.0146
114	3.7763	0.0145
115	3.7907	0.0144
116	3.8051	0.0144
117	3.8193	0.0143
118	3.8336	0.0142
119	3.8477	0.0142
120	3.8618	0.0141
121	3.8758	0.0140
122	3.8898	0.0140
123	3.9037	0.0139
124	3.9175	0.0138
125	3.9312	0.0138
126	3.9450	0.0137
127	3.9586	0.0136
128	3.9722	0.0136
129	3.9857	0.0135
130	3.9992	0.0135
131	4.0126	0.0134
132	4.0259	0.0133
133	4.0392	0.0133
134	4.0524	0.0132
135	4.0656	0.0132
136	4.0787	0.0131
137	4.0918	0.0131
138	4.1048	0.0130
139	4.1178	0.0130
140	4.1307	0.0129
141	4.1435	0.0129
142	4.1563	0.0128
143	4.1691	0.0128
144	4.1818	0.0127
145	4.1945	0.0127
146	4.2071	0.0126
147	4.2196	0.0126
148	4.2321	0.0125
149	4.2446	0.0125
150	4.2570	0.0124
151	4.2694	0.0124
152	4.2817	0.0123
153	4.2940	0.0123
154	4.3062	0.0122
155	4.3184	0.0122
156	4.3305	0.0121
157	4.3426	0.0121
158	4.3547	0.0121
159	4.3667	0.0120
160	4.3787	0.0120
161	4.3906	0.0119
162	4.4025	0.0119
163	4.4143	0.0118
164	4.4261	0.0118
165	4.4379	0.0118
166	4.4496	0.0117
167	4.4613	0.0117
168	4.4729	0.0116
169	4.4846	0.0116

170	4.4961	0.0116
171	4.5077	0.0115
172	4.5191	0.0115
173	4.5306	0.0115
174	4.5420	0.0114
175	4.5534	0.0114
176	4.5647	0.0113
177	4.5760	0.0113
178	4.5873	0.0113
179	4.5985	0.0112
180	4.6097	0.0112
181	4.6209	0.0112
182	4.6320	0.0111
183	4.6431	0.0111
184	4.6542	0.0111
185	4.6652	0.0110
186	4.6762	0.0110
187	4.6872	0.0110
188	4.6981	0.0109
189	4.7090	0.0109
190	4.7199	0.0109
191	4.7307	0.0108
192	4.7415	0.0108
193	4.7523	0.0108
194	4.7630	0.0107
195	4.7737	0.0107
196	4.7844	0.0107
197	4.7950	0.0106
198	4.8056	0.0106
199	4.8162	0.0106
200	4.8268	0.0106
201	4.8373	0.0105
202	4.8478	0.0105
203	4.8582	0.0105
204	4.8687	0.0104
205	4.8791	0.0104
206	4.8895	0.0104
207	4.8998	0.0103
208	4.9101	0.0103
209	4.9204	0.0103
210	4.9307	0.0103
211	4.9409	0.0102
212	4.9511	0.0102
213	4.9613	0.0102
214	4.9715	0.0102
215	4.9816	0.0101
216	4.9917	0.0101
217	5.0018	0.0101
218	5.0118	0.0101
219	5.0219	0.0100
220	5.0319	0.0100
221	5.0418	0.0100
222	5.0518	0.0099
223	5.0617	0.0099
224	5.0716	0.0099
225	5.0815	0.0099
226	5.0913	0.0098
227	5.1012	0.0098
228	5.1110	0.0098
229	5.1207	0.0098
230	5.1305	0.0098
231	5.1402	0.0097
232	5.1499	0.0097
233	5.1596	0.0097
234	5.1693	0.0097
235	5.1789	0.0096
236	5.1885	0.0096
237	5.1981	0.0096
238	5.2077	0.0096
239	5.2172	0.0095
240	5.2267	0.0095

241	5.2362	0.0095
242	5.2457	0.0095
243	5.2551	0.0095
244	5.2646	0.0094
245	5.2740	0.0094
246	5.2834	0.0094
247	5.2927	0.0094
248	5.3021	0.0093
249	5.3114	0.0093
250	5.3207	0.0093
251	5.3300	0.0093
252	5.3393	0.0093
253	5.3485	0.0092
254	5.3577	0.0092
255	5.3669	0.0092
256	5.3761	0.0092
257	5.3853	0.0092
258	5.3944	0.0091
259	5.4035	0.0091
260	5.4126	0.0091
261	5.4217	0.0091
262	5.4308	0.0091
263	5.4398	0.0090
264	5.4488	0.0090
265	5.4578	0.0090
266	5.4668	0.0090
267	5.4758	0.0090
268	5.4847	0.0089
269	5.4936	0.0089
270	5.5026	0.0089
271	5.5114	0.0089
272	5.5203	0.0089
273	5.5292	0.0089
274	5.5380	0.0088
275	5.5468	0.0088
276	5.5556	0.0088
277	5.5644	0.0088
278	5.5732	0.0088
279	5.5819	0.0087
280	5.5906	0.0087
281	5.5993	0.0087
282	5.6080	0.0087
283	5.6167	0.0087
284	5.6254	0.0087
285	5.6340	0.0086
286	5.6426	0.0086
287	5.6512	0.0086
288	5.6598	0.0086

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0086	0.0013	0.0073
2	0.0086	0.0013	0.0073
3	0.0086	0.0013	0.0073
4	0.0087	0.0013	0.0074
5	0.0087	0.0013	0.0074
6	0.0087	0.0013	0.0074
7	0.0087	0.0013	0.0074
8	0.0088	0.0013	0.0075
9	0.0088	0.0013	0.0075
10	0.0088	0.0013	0.0075
11	0.0089	0.0013	0.0075
12	0.0089	0.0013	0.0075
13	0.0089	0.0013	0.0076
14	0.0089	0.0013	0.0076
15	0.0090	0.0013	0.0076
16	0.0090	0.0013	0.0076
17	0.0090	0.0013	0.0077
18	0.0090	0.0014	0.0077

19	0.0091	0.0014	0.0077
20	0.0091	0.0014	0.0077
21	0.0091	0.0014	0.0078
22	0.0092	0.0014	0.0078
23	0.0092	0.0014	0.0078
24	0.0092	0.0014	0.0078
25	0.0093	0.0014	0.0079
26	0.0093	0.0014	0.0079
27	0.0093	0.0014	0.0079
28	0.0093	0.0014	0.0079
29	0.0094	0.0014	0.0080
30	0.0094	0.0014	0.0080
31	0.0095	0.0014	0.0080
32	0.0095	0.0014	0.0081
33	0.0095	0.0014	0.0081
34	0.0095	0.0014	0.0081
35	0.0096	0.0014	0.0082
36	0.0096	0.0014	0.0082
37	0.0097	0.0014	0.0082
38	0.0097	0.0014	0.0082
39	0.0097	0.0015	0.0083
40	0.0098	0.0015	0.0083
41	0.0098	0.0015	0.0083
42	0.0098	0.0015	0.0084
43	0.0099	0.0015	0.0084
44	0.0099	0.0015	0.0084
45	0.0099	0.0015	0.0085
46	0.0100	0.0015	0.0085
47	0.0100	0.0015	0.0085
48	0.0101	0.0015	0.0085
49	0.0101	0.0015	0.0086
50	0.0101	0.0015	0.0086
51	0.0102	0.0015	0.0087
52	0.0102	0.0015	0.0087
53	0.0103	0.0015	0.0087
54	0.0103	0.0015	0.0088
55	0.0103	0.0015	0.0088
56	0.0104	0.0016	0.0088
57	0.0104	0.0016	0.0089
58	0.0105	0.0016	0.0089
59	0.0105	0.0016	0.0090
60	0.0106	0.0016	0.0090
61	0.0106	0.0016	0.0090
62	0.0106	0.0016	0.0091
63	0.0107	0.0016	0.0091
64	0.0107	0.0016	0.0091
65	0.0108	0.0016	0.0092
66	0.0108	0.0016	0.0092
67	0.0109	0.0016	0.0093
68	0.0109	0.0016	0.0093
69	0.0110	0.0016	0.0094
70	0.0110	0.0016	0.0094
71	0.0111	0.0017	0.0094
72	0.0111	0.0017	0.0095
73	0.0112	0.0017	0.0095
74	0.0112	0.0017	0.0096
75	0.0113	0.0017	0.0096
76	0.0113	0.0017	0.0096
77	0.0114	0.0017	0.0097
78	0.0115	0.0017	0.0097
79	0.0115	0.0017	0.0098
80	0.0116	0.0017	0.0098
81	0.0116	0.0017	0.0099
82	0.0117	0.0017	0.0099
83	0.0118	0.0018	0.0100
84	0.0118	0.0018	0.0100
85	0.0119	0.0018	0.0101
86	0.0119	0.0018	0.0101
87	0.0120	0.0018	0.0102
88	0.0121	0.0018	0.0103
89	0.0121	0.0018	0.0103

90	0.0122	0.0018	0.0104
91	0.0123	0.0018	0.0104
92	0.0123	0.0018	0.0105
93	0.0124	0.0019	0.0106
94	0.0125	0.0019	0.0106
95	0.0126	0.0019	0.0107
96	0.0126	0.0019	0.0107
97	0.0127	0.0019	0.0108
98	0.0128	0.0019	0.0108
99	0.0129	0.0019	0.0109
100	0.0129	0.0019	0.0110
101	0.0130	0.0019	0.0111
102	0.0131	0.0020	0.0111
103	0.0132	0.0020	0.0112
104	0.0132	0.0020	0.0113
105	0.0133	0.0020	0.0114
106	0.0134	0.0020	0.0114
107	0.0135	0.0020	0.0115
108	0.0136	0.0020	0.0116
109	0.0137	0.0020	0.0117
110	0.0138	0.0021	0.0117
111	0.0139	0.0021	0.0118
112	0.0140	0.0021	0.0119
113	0.0141	0.0021	0.0120
114	0.0142	0.0021	0.0120
115	0.0143	0.0021	0.0122
116	0.0144	0.0021	0.0122
117	0.0145	0.0022	0.0123
118	0.0146	0.0022	0.0124
119	0.0147	0.0022	0.0125
120	0.0148	0.0022	0.0126
121	0.0149	0.0022	0.0127
122	0.0150	0.0022	0.0128
123	0.0152	0.0023	0.0129
124	0.0153	0.0023	0.0130
125	0.0154	0.0023	0.0131
126	0.0155	0.0023	0.0132
127	0.0157	0.0023	0.0134
128	0.0158	0.0024	0.0134
129	0.0160	0.0024	0.0136
130	0.0161	0.0024	0.0137
131	0.0163	0.0024	0.0138
132	0.0164	0.0024	0.0139
133	0.0166	0.0025	0.0141
134	0.0167	0.0025	0.0142
135	0.0169	0.0025	0.0144
136	0.0170	0.0025	0.0145
137	0.0172	0.0026	0.0147
138	0.0174	0.0026	0.0148
139	0.0176	0.0026	0.0150
140	0.0177	0.0026	0.0151
141	0.0180	0.0027	0.0153
142	0.0181	0.0027	0.0154
143	0.0184	0.0027	0.0156
144	0.0185	0.0028	0.0158
145	0.0208	0.0031	0.0177
146	0.0210	0.0031	0.0178
147	0.0213	0.0032	0.0181
148	0.0214	0.0032	0.0182
149	0.0218	0.0033	0.0185
150	0.0220	0.0033	0.0187
151	0.0223	0.0033	0.0190
152	0.0225	0.0034	0.0191
153	0.0229	0.0034	0.0195
154	0.0231	0.0035	0.0196
155	0.0235	0.0035	0.0200
156	0.0237	0.0035	0.0202
157	0.0242	0.0036	0.0206
158	0.0244	0.0036	0.0208
159	0.0249	0.0037	0.0212
160	0.0252	0.0038	0.0214

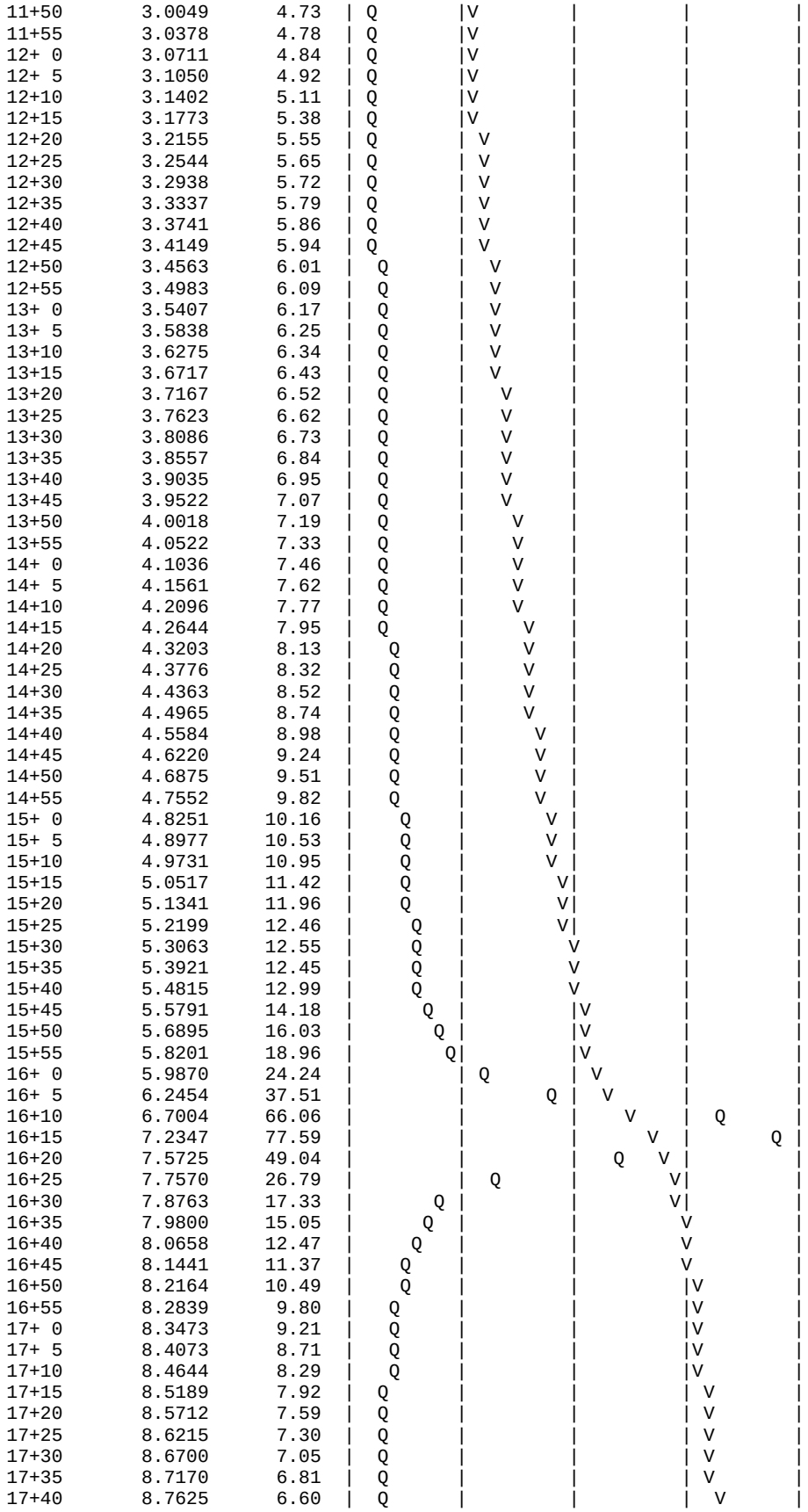
161	0.0257	0.0038	0.0219
162	0.0260	0.0039	0.0221
163	0.0266	0.0040	0.0226
164	0.0269	0.0040	0.0229
165	0.0276	0.0041	0.0235
166	0.0279	0.0042	0.0237
167	0.0287	0.0043	0.0244
168	0.0291	0.0043	0.0247
169	0.0299	0.0045	0.0255
170	0.0304	0.0045	0.0258
171	0.0313	0.0047	0.0267
172	0.0318	0.0048	0.0271
173	0.0329	0.0049	0.0280
174	0.0335	0.0050	0.0285
175	0.0348	0.0052	0.0296
176	0.0355	0.0053	0.0302
177	0.0370	0.0055	0.0315
178	0.0379	0.0057	0.0322
179	0.0397	0.0059	0.0338
180	0.0408	0.0061	0.0347
181	0.0431	0.0064	0.0367
182	0.0445	0.0066	0.0378
183	0.0475	0.0071	0.0404
184	0.0493	0.0074	0.0419
185	0.0444	0.0066	0.0378
186	0.0469	0.0070	0.0399
187	0.0533	0.0080	0.0453
188	0.0574	0.0086	0.0488
189	0.0692	0.0093	0.0599
190	0.0781	0.0093	0.0688
191	0.1117	0.0093	0.1024
192	0.1535	0.0093	0.1443
193	0.4806	0.0093	0.4713
194	0.0909	0.0093	0.0817
195	0.0626	0.0093	0.0533
196	0.0498	0.0074	0.0424
197	0.0513	0.0077	0.0436
198	0.0459	0.0069	0.0391
199	0.0419	0.0063	0.0356
200	0.0388	0.0058	0.0330
201	0.0363	0.0054	0.0308
202	0.0342	0.0051	0.0291
203	0.0324	0.0048	0.0275
204	0.0309	0.0046	0.0262
205	0.0295	0.0044	0.0251
206	0.0283	0.0042	0.0241
207	0.0272	0.0041	0.0232
208	0.0263	0.0039	0.0224
209	0.0254	0.0038	0.0216
210	0.0247	0.0037	0.0210
211	0.0240	0.0036	0.0204
212	0.0233	0.0035	0.0198
213	0.0227	0.0034	0.0193
214	0.0221	0.0033	0.0188
215	0.0216	0.0032	0.0184
216	0.0211	0.0032	0.0180
217	0.0187	0.0028	0.0159
218	0.0182	0.0027	0.0155
219	0.0178	0.0027	0.0152
220	0.0175	0.0026	0.0149
221	0.0171	0.0026	0.0146
222	0.0168	0.0025	0.0143
223	0.0165	0.0025	0.0140
224	0.0162	0.0024	0.0138
225	0.0159	0.0024	0.0135
226	0.0156	0.0023	0.0133
227	0.0154	0.0023	0.0131
228	0.0151	0.0023	0.0129
229	0.0149	0.0022	0.0126
230	0.0146	0.0022	0.0125
231	0.0144	0.0022	0.0123

```
      232              0.0142          0.0021              0.0121
      233              0.0140          0.0021              0.0119
      234              0.0138          0.0021              0.0118
      235              0.0136          0.0020              0.0116
      236              0.0135          0.0020              0.0114
      237              0.0133          0.0020              0.0113
      238              0.0131          0.0020              0.0112
      239              0.0130          0.0019              0.0110
      240              0.0128          0.0019              0.0109
      241              0.0127          0.0019              0.0108
      242              0.0125          0.0019              0.0106
      243              0.0124          0.0018              0.0105
      244              0.0122          0.0018              0.0104
      245              0.0121          0.0018              0.0103
      246              0.0120          0.0018              0.0102
      247              0.0118          0.0018              0.0101
      248              0.0117          0.0018              0.0100
      249              0.0116          0.0017              0.0099
      250              0.0115          0.0017              0.0098
      251              0.0114          0.0017              0.0097
      252              0.0113          0.0017              0.0096
      253              0.0112          0.0017              0.0095
      254              0.0111          0.0017              0.0094
      255              0.0110          0.0016              0.0093
      256              0.0109          0.0016              0.0092
      257              0.0108          0.0016              0.0092
      258              0.0107          0.0016              0.0091
      259              0.0106          0.0016              0.0090
      260              0.0105          0.0016              0.0089
      261              0.0104          0.0016              0.0089
      262              0.0103          0.0015              0.0088
      263              0.0102          0.0015              0.0087
      264              0.0102          0.0015              0.0086
      265              0.0101          0.0015              0.0086
      266              0.0100          0.0015              0.0085
      267              0.0099          0.0015              0.0084
      268              0.0098          0.0015              0.0084
      269              0.0098          0.0015              0.0083
      270              0.0097          0.0015              0.0083
      271              0.0096          0.0014              0.0082
      272              0.0096          0.0014              0.0081
      273              0.0095          0.0014              0.0081
      274              0.0094          0.0014              0.0080
      275              0.0094          0.0014              0.0080
      276              0.0093          0.0014              0.0079
      277              0.0092          0.0014              0.0079
      278              0.0092          0.0014              0.0078
      279              0.0091          0.0014              0.0078
      280              0.0091          0.0014              0.0077
      281              0.0090          0.0013              0.0077
      282              0.0089          0.0013              0.0076
      283              0.0089          0.0013              0.0076
      284              0.0088          0.0013              0.0075
      285              0.0088          0.0013              0.0075
      286              0.0087          0.0013              0.0074
      287              0.0087          0.0013              0.0074
      288              0.0086          0.0013              0.0073
      ------------------------------------------------------------------
      ------------------------------------------------------------------
      Total soil rain loss =      0.75(In)
      Total effective rainfall =      4.91(In)
      Peak flow rate in flood hydrograph =     77.59(CFS)
      ------------------------------------------------------------------
      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                          24 - H O U R    S T O R M
                     R u n o f f      H y d r o g r a p h
      ------------------------------------------------------------------
                  Hydrograph in   5   Minute intervals ((CFS))

      ------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0       20.0      40.0      60.0      80.0
```

0+ 5	0.0007	0.11	Q				
0+10	0.0056	0.71	Q				
0+15	0.0167	1.61	Q				
0+20	0.0311	2.08	VQ				
0+25	0.0465	2.24	VQ				
0+30	0.0622	2.28	VQ				
0+35	0.0782	2.32	VQ				
0+40	0.0942	2.32	VQ				
0+45	0.1102	2.33	VQ				
0+50	0.1263	2.34	VQ				
0+55	0.1425	2.34	VQ				
1+ 0	0.1587	2.35	VQ				
1+ 5	0.1749	2.36	VQ				
1+10	0.1912	2.37	VQ				
1+15	0.2076	2.37	VQ				
1+20	0.2240	2.38	VQ				
1+25	0.2404	2.39	VQ				
1+30	0.2569	2.40	VQ				
1+35	0.2735	2.40	|Q				
1+40	0.2901	2.41	|Q				
1+45	0.3068	2.42	|Q				
1+50	0.3235	2.43	|Q				
1+55	0.3403	2.44	|Q				
2+ 0	0.3571	2.44	|Q				
2+ 5	0.3740	2.45	|Q				
2+10	0.3909	2.46	|Q				
2+15	0.4079	2.47	|Q				
2+20	0.4250	2.48	|Q				
2+25	0.4421	2.49	|Q				
2+30	0.4593	2.49	|Q				
2+35	0.4765	2.50	|Q				
2+40	0.4938	2.51	|Q				
2+45	0.5112	2.52	|Q				
2+50	0.5286	2.53	|Q				
2+55	0.5460	2.54	|QV				
3+ 0	0.5636	2.55	|QV				
3+ 5	0.5812	2.56	|QV				
3+10	0.5988	2.56	|QV				
3+15	0.6166	2.57	|QV				
3+20	0.6343	2.58	|QV				
3+25	0.6522	2.59	|QV				
3+30	0.6701	2.60	|QV				
3+35	0.6881	2.61	|QV				
3+40	0.7062	2.62	|QV				
3+45	0.7243	2.63	|QV				
3+50	0.7425	2.64	|QV				
3+55	0.7607	2.65	|QV				
4+ 0	0.7791	2.66	|QV				
4+ 5	0.7975	2.67	|Q V				
4+10	0.8159	2.68	|Q V				
4+15	0.8345	2.69	|Q V				
4+20	0.8531	2.70	|Q V				
4+25	0.8718	2.71	|Q V				
4+30	0.8905	2.72	|Q V				
4+35	0.9094	2.74	|Q V				
4+40	0.9283	2.75	|Q V				
4+45	0.9473	2.76	|Q V				
4+50	0.9664	2.77	|Q V				
4+55	0.9855	2.78	|Q V				
5+ 0	1.0047	2.79	|Q V				
5+ 5	1.0241	2.80	|Q V				
5+10	1.0434	2.82	|Q V				
5+15	1.0629	2.83	|Q V				
5+20	1.0825	2.84	|Q V				
5+25	1.1021	2.85	|Q V				
5+30	1.1219	2.86	|Q V				
5+35	1.1417	2.88	|Q V				
5+40	1.1616	2.89	|Q V				
5+45	1.1816	2.90	|Q V				
5+50	1.2016	2.92	|Q V				

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 5+55       1.2218      2.93  |Q  V     |         |         |         |
 6+ 0       1.2421      2.94  |Q  V     |         |         |         |
 6+ 5       1.2624      2.96  |Q  V     |         |         |         |
 6+10       1.2829      2.97  |Q  V     |         |         |         |
 6+15       1.3035      2.98  |Q  V     |         |         |         |
 6+20       1.3241      3.00  |Q  V     |         |         |         |
 6+25       1.3448      3.01  |Q   V    |         |         |         |
 6+30       1.3657      3.03  |Q   V    |         |         |         |
 6+35       1.3866      3.04  |Q   V    |         |         |         |
 6+40       1.4077      3.06  |Q   V    |         |         |         |
 6+45       1.4288      3.07  |Q   V    |         |         |         |
 6+50       1.4501      3.09  |Q   V    |         |         |         |
 6+55       1.4715      3.10  |Q   V    |         |         |         |
 7+ 0       1.4929      3.12  |Q   V    |         |         |         |
 7+ 5       1.5145      3.13  |Q   V    |         |         |         |
 7+10       1.5362      3.15  |Q   V    |         |         |         |
 7+15       1.5580      3.17  |Q   V    |         |         |         |
 7+20       1.5800      3.18  |Q   V    |         |         |         |
 7+25       1.6020      3.20  |Q    V   |         |         |         |
 7+30       1.6242      3.22  |Q    V   |         |         |         |
 7+35       1.6464      3.23  |Q    V   |         |         |         |
 7+40       1.6688      3.25  |Q    V   |         |         |         |
 7+45       1.6914      3.27  |Q    V   |         |         |         |
 7+50       1.7140      3.29  |Q    V   |         |         |         |
 7+55       1.7368      3.31  |Q    V   |         |         |         |
 8+ 0       1.7597      3.33  |Q    V   |         |         |         |
 8+ 5       1.7827      3.35  |Q    V   |         |         |         |
 8+10       1.8059      3.36  |Q    V   |         |         |         |
 8+15       1.8292      3.38  |Q    V   |         |         |         |
 8+20       1.8526      3.40  |Q    V   |         |         |         |
 8+25       1.8762      3.42  |Q     V  |         |         |         |
 8+30       1.9000      3.45  |Q     V  |         |         |         |
 8+35       1.9238      3.47  |Q     V  |         |         |         |
 8+40       1.9478      3.49  |Q     V  |         |         |         |
 8+45       1.9720      3.51  |Q     V  |         |         |         |
 8+50       1.9963      3.53  |Q     V  |         |         |         |
 8+55       2.0208      3.55  |Q     V  |         |         |         |
 9+ 0       2.0455      3.58  |Q     V  |         |         |         |
 9+ 5       2.0703      3.60  |Q     V  |         |         |         |
 9+10       2.0952      3.62  |Q     V  |         |         |         |
 9+15       2.1203      3.65  |Q      V |         |         |         |
 9+20       2.1456      3.67  |Q      V |         |         |         |
 9+25       2.1711      3.70  |Q      V |         |         |         |
 9+30       2.1968      3.72  |Q      V |         |         |         |
 9+35       2.2226      3.75  |Q      V |         |         |         |
 9+40       2.2486      3.78  |Q      V |         |         |         |
 9+45       2.2748      3.80  |Q      V |         |         |         |
 9+50       2.3012      3.83  |Q      V |         |         |         |
 9+55       2.3278      3.86  |Q      V |         |         |         |
10+ 0       2.3546      3.89  |Q      V |         |         |         |
10+ 5       2.3816      3.92  |Q      V |         |         |         |
10+10       2.4088      3.95  |Q       V|         |         |         |
10+15       2.4362      3.98  |Q       V|         |         |         |
10+20       2.4638      4.01  | Q      V|         |         |         |
10+25       2.4917      4.04  | Q      V|         |         |         |
10+30       2.5198      4.08  | Q      V|         |         |         |
10+35       2.5481      4.11  | Q      V|         |         |         |
10+40       2.5766      4.15  | Q      V|         |         |         |
10+45       2.6054      4.18  | Q      V|         |         |         |
10+50       2.6345      4.22  | Q      V|         |         |         |
10+55       2.6638      4.25  | Q       V         |         |         |
11+ 0       2.6933      4.29  | Q       V         |         |         |
11+ 5       2.7231      4.33  | Q       V         |         |         |
11+10       2.7532      4.37  | Q       V         |         |         |
11+15       2.7836      4.41  | Q       V         |         |         |
11+20       2.8143      4.45  | Q       V         |         |         |
11+25       2.8453      4.50  | Q       V         |         |         |
11+30       2.8766      4.54  | Q       V         |         |         |
11+35       2.9081      4.59  | Q       V         |         |         |
11+40       2.9401      4.63  | Q       |V        |         |         |
11+45       2.9723      4.68  | Q       |V        |         |         |
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11+50	3.0049	4.73	Q	V			
11+55	3.0378	4.78	Q	V			
12+ 0	3.0711	4.84	Q	V			
12+ 5	3.1050	4.92	Q	V			
12+10	3.1402	5.11	Q	V			
12+15	3.1773	5.38	Q	V			
12+20	3.2155	5.55	Q	V			
12+25	3.2544	5.65	Q	V			
12+30	3.2938	5.72	Q	V			
12+35	3.3337	5.79	Q	V			
12+40	3.3741	5.86	Q	V			
12+45	3.4149	5.94	Q	V			
12+50	3.4563	6.01	Q	V			
12+55	3.4983	6.09	Q	V			
13+ 0	3.5407	6.17	Q	V			
13+ 5	3.5838	6.25	Q	V			
13+10	3.6275	6.34	Q	V			
13+15	3.6717	6.43	Q	V			
13+20	3.7167	6.52	Q	V			
13+25	3.7623	6.62	Q	V			
13+30	3.8086	6.73	Q	V			
13+35	3.8557	6.84	Q	V			
13+40	3.9035	6.95	Q	V			
13+45	3.9522	7.07	Q	V			
13+50	4.0018	7.19	Q	V			
13+55	4.0522	7.33	Q	V			
14+ 0	4.1036	7.46	Q	V			
14+ 5	4.1561	7.62	Q	V			
14+10	4.2096	7.77	Q	V			
14+15	4.2644	7.95	Q	V			
14+20	4.3203	8.13	Q	V			
14+25	4.3776	8.32	Q	V			
14+30	4.4363	8.52	Q	V			
14+35	4.4965	8.74	Q	V			
14+40	4.5584	8.98	Q	V			
14+45	4.6220	9.24	Q	V			
14+50	4.6875	9.51	Q	V			
14+55	4.7552	9.82	Q	V			
15+ 0	4.8251	10.16	Q	V			
15+ 5	4.8977	10.53	Q	V			
15+10	4.9731	10.95	Q	V			
15+15	5.0517	11.42	Q	V			
15+20	5.1341	11.96	Q	V			
15+25	5.2199	12.46	Q	V			
15+30	5.3063	12.55	Q	V			
15+35	5.3921	12.45	Q	V			
15+40	5.4815	12.99	Q	V			
15+45	5.5791	14.18	Q	V			
15+50	5.6895	16.03	Q	V			
15+55	5.8201	18.96	Q	V			
16+ 0	5.9870	24.24	Q	V			
16+ 5	6.2454	37.51	Q	V			
16+10	6.7004	66.06	Q	V			
16+15	7.2347	77.59	Q	V			
16+20	7.5725	49.04	Q	V			
16+25	7.7570	26.79	Q	V			
16+30	7.8763	17.33	Q	V			
16+35	7.9800	15.05	Q	V			
16+40	8.0658	12.47	Q	V			
16+45	8.1441	11.37	Q	V			
16+50	8.2164	10.49	Q	V			
16+55	8.2839	9.80	Q	V			
17+ 0	8.3473	9.21	Q	V			
17+ 5	8.4073	8.71	Q	V			
17+10	8.4644	8.29	Q	V			
17+15	8.5189	7.92	Q	V			
17+20	8.5712	7.59	Q	V			
17+25	8.6215	7.30	Q	V			
17+30	8.6700	7.05	Q	V			
17+35	8.7170	6.81	Q	V			
17+40	8.7625	6.60	Q	V			

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17+45      8.8066     6.41  |  Q      |         |         |  V      |
17+50      8.8496     6.23  |  Q      |         |         |  V      |
17+55      8.8914     6.07  |  Q      |         |         |  V      |
18+ 0      8.9322     5.92  | Q       |         |         |  V      |
18+ 5      8.9718     5.75  | Q       |         |         |  V      |
18+10      9.0096     5.48  | Q       |         |         |   V     |
18+15      9.0450     5.15  | Q       |         |         |   V     |
18+20      9.0790     4.93  | Q       |         |         |   V     |
18+25      9.1119     4.79  | Q       |         |         |   V     |
18+30      9.1442     4.68  | Q       |         |         |   V     |
18+35      9.1757     4.58  | Q       |         |         |   V     |
18+40      9.2066     4.49  | Q       |         |         |   V     |
18+45      9.2369     4.40  | Q       |         |         |   V     |
18+50      9.2667     4.32  | Q       |         |         |   V     |
18+55      9.2959     4.25  | Q       |         |         |    V    |
19+ 0      9.3246     4.17  | Q       |         |         |    V    |
19+ 5      9.3529     4.10  | Q       |         |         |    V    |
19+10      9.3807     4.04  | Q       |         |         |    V    |
19+15      9.4081     3.97  |Q        |         |         |    V    |
19+20      9.4350     3.91  |Q        |         |         |    V    |
19+25      9.4615     3.85  |Q        |         |         |    V    |
19+30      9.4877     3.80  |Q        |         |         |    V    |
19+35      9.5135     3.74  |Q        |         |         |    V    |
19+40      9.5389     3.69  |Q        |         |         |     V   |
19+45      9.5640     3.64  |Q        |         |         |     V   |
19+50      9.5888     3.60  |Q        |         |         |     V   |
19+55      9.6132     3.55  |Q        |         |         |     V   |
20+ 0      9.6373     3.50  |Q        |         |         |     V   |
20+ 5      9.6612     3.46  |Q        |         |         |     V   |
20+10      9.6847     3.42  |Q        |         |         |     V   |
20+15      9.7080     3.38  |Q        |         |         |     V   |
20+20      9.7310     3.34  |Q        |         |         |     V   |
20+25      9.7538     3.30  |Q        |         |         |     V   |
20+30      9.7762     3.27  |Q        |         |         |     V   |
20+35      9.7985     3.23  |Q        |         |         |     V   |
20+40      9.8205     3.20  |Q        |         |         |      V  |
20+45      9.8423     3.16  |Q        |         |         |      V  |
20+50      9.8638     3.13  |Q        |         |         |      V  |
20+55      9.8852     3.10  |Q        |         |         |      V  |
21+ 0      9.9063     3.07  |Q        |         |         |      V  |
21+ 5      9.9272     3.04  |Q        |         |         |      V  |
21+10      9.9480     3.01  |Q        |         |         |      V  |
21+15      9.9685     2.98  |Q        |         |         |      V  |
21+20      9.9888     2.95  |Q        |         |         |      V  |
21+25     10.0090     2.93  |Q        |         |         |      V  |
21+30     10.0289     2.90  |Q        |         |         |      V  |
21+35     10.0487     2.87  |Q        |         |         |      V  |
21+40     10.0684     2.85  |Q        |         |         |       V |
21+45     10.0878     2.82  |Q        |         |         |       V |
21+50     10.1071     2.80  |Q        |         |         |       V |
21+55     10.1262     2.78  |Q        |         |         |       V |
22+ 0     10.1452     2.75  |Q        |         |         |       V |
22+ 5     10.1640     2.73  |Q        |         |         |       V |
22+10     10.1827     2.71  |Q        |         |         |       V |
22+15     10.2012     2.69  |Q        |         |         |       V |
22+20     10.2196     2.67  |Q        |         |         |       V |
22+25     10.2378     2.65  |Q        |         |         |       V |
22+30     10.2559     2.63  |Q        |         |         |       V |
22+35     10.2739     2.61  |Q        |         |         |       V |
22+40     10.2917     2.59  |Q        |         |         |       V |
22+45     10.3095     2.57  |Q        |         |         |       V |
22+50     10.3270     2.55  |Q        |         |         |       V |
22+55     10.3445     2.53  |Q        |         |         |        V|
23+ 0     10.3618     2.52  |Q        |         |         |        V|
23+ 5     10.3790     2.50  |Q        |         |         |        V|
23+10     10.3961     2.48  |Q        |         |         |        V|
23+15     10.4131     2.47  |Q        |         |         |        V|
23+20     10.4300     2.45  |Q        |         |         |        V|
23+25     10.4468     2.43  |Q        |         |         |        V|
23+30     10.4634     2.42  |Q        |         |         |        V|
23+35     10.4800     2.40  |Q        |         |         |        V|
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   23+40      10.4964      2.39  |Q        |         |         |        V|
   23+45      10.5127      2.37  |Q        |         |         |        V|
   23+50      10.5290      2.36  |Q        |         |         |        V|
   23+55      10.5451      2.34  |Q        |         |         |        V|
   24+ 0      10.5612      2.33  |Q        |         |         |        V|
   24+ 5      10.5763      2.21  |Q        |         |         |        V|
   24+10      10.5873      1.60  Q         |         |         |        V|
   24+15      10.5921      0.69  Q         |         |         |        V|
   24+20      10.5936      0.22  Q         |         |         |        V|
   24+25      10.5940      0.06  Q         |         |         |        V|
   24+30      10.5942      0.03  Q         |         |         |        V|
-------------------------------------------------------------------------
```

APPENDIX E: PRELIMINARY STORM DRAIN SIZING CALCULATIONS

APPENDIX E.1: LINE 1 STORM DRAIN SYSTEMS

LINE 1

PIPE SIZING (SOFFIT CONTROL)

DS WSE	SYSTEM	PIPE DIA.	PIPE LENGTH	Q (cfs)	K	PIPE SLOPE	DS INVERT	US INVERT	FRICTION SLOPE	VELOCITY	VELOCITY HEAD	LOSS COEFFICIENT	LOSSES	US WSE
995.00	LINE 1	108	1164.18	700.80	12486.64	0.0100	986.00	997.64	0.0031	11.0303	1.8858	1.5000	2.8288	1001.50
1001.50	LINE 1	96	276.51	700.80	9120.89	0.0100	997.64	1000.41	0.0059	13.9602	3.0208	1.5000	4.5311	1007.66
1007.66	LINE 1	96	377.86	681.72	9120.89	0.0100	1000.41	1004.19	0.0056	13.5801	2.8585	1.5000	4.2878	1014.06
1014.06	LINE 1	72	860.84	278.26	4235.09	0.0100	1004.19	1012.79	0.0043	9.8543	1.5052	1.5000	2.2577	1020.03

LOSS		
TRANSITION STRUCTURE	0.25	0.25
WALL ENTRANCE	0.25	0.25
JUNCTION STRUCTURE	0.50	1.00
		2.50

LAT 1A

PIPE SIZING (SOFFIT CONTROL)

DS WSE	SYSTEM	PIPE DIA.	PIPE LENGTH	Q (cfs)	K	PIPE SLOPE	DS INVERT	US INVERT	FRICTION SLOPE	VELOCITY	VELOCITY HEAD	LOSS COEFFICIENT	LOSSES	US WSE
1007.66	LAT 1A	24	121.37	19.08	226.22	0.0050	1007.66	1008.27	0.0071	6.0813	0.5732	1.5000	0.8598	1009.38

LAT 1B

PIPE SIZING (SOFFIT CONTROL)

DS WSE	SYSTEM	PIPE DIA.	PIPE LENGTH	Q (cfs)	K	PIPE SLOPE	DS INVERT	US INVERT	FRICTION SLOPE	VELOCITY	VELOCITY HEAD	LOSS COEFFICIENT	LOSSES	US WSE
1014.06	LAT 1B	48	122.64	112.72	1436.42	0.0200	1014.06	1016.51	0.0062	8.9817	1.2504	1.5000	1.8756	1016.69

APPENDIX E.2: LINE 2 STORM DRAIN SYSTEM

LINE 2

PIPE SIZING (SOFFIT CONTROL)														
DS WSE	SYSTEM	PIPE DIA.	PIPE LENGTH	Q (cfs)	K	PIPE SLOPE	DS INVERT	US INVERT	FRICTION SLOPE	VELOCITY	VELOCITY HEAD	LOSS COEFFICIENT	LOSSES	US WSE
1008.78	LINE 2	24	57.50	9.94	226.22	0.0049	1007.90	1008.18	0.0019	3.1671	0.1555	1.5000	0.2332	1009.12
1009.12	LINE 2	24	255.27	9.94	226.22	0.0040	1008.18	1009.20	0.0019	3.1671	0.1555	1.5000	0.2332	1009.85

NOTE: Flow rate was divided by 3 in order to account for a triple 24" system

LOSS		
TRANSITION STRUCTURE	0.25	0.25
WALL ENTRANCE	0.25	0.25
JUNCTION STRUCTURE	0.50	1.00
		2.50

APPENDIX E.3: LINE C AND LINE D STORM DRAIN SYSTEMS

LINE C

PIPE SIZING (SOFFIT CONTROL)														
DS WSE	SYSTEM	PIPE DIA.	PIPE LENGTH	Q (cfs)	K	PIPE SLOPE	DS INVERT	US INVERT	FRICTION SLOPE	VELOCITY	VELOCITY HEAD	LOSS COEFFICIENT	LOSSES	US WSE
1010.73	LINE C	48	121.37	56.45	1436.42	0.0050	1008.50	1009.11	0.0015	4.4980	0.3136	1.5000	0.4704	1011.39

LINE D1

PIPE SIZING (SOFFIT CONTROL)														
DS WSE	SYSTEM	PIPE DIA.	PIPE LENGTH	Q (cfs)	K	PIPE SLOPE	DS INVERT	US INVERT	FRICTION SLOPE	VELOCITY	VELOCITY HEAD	LOSS COEFFICIENT	LOSSES	US WSE
1010.73	LINE D1	36	16.30	24.05	666.97	0.0050	1006.00	1006.08	0.0013	3.4068	0.1799	1.5000	0.2699	1011.02
1011.02	LINE D1	36	113.31	14.35	666.97	0.0050	1006.08	1006.65	0.0005	2.0328	0.0640	1.5000	0.0961	1011.17

LAT D1

PIPE SIZING (SOFFIT CONTROL)														
DS WSE	SYSTEM	PIPE DIA.	PIPE LENGTH	Q (cfs)	K	PIPE SLOPE	DS INVERT	US INVERT	FRICTION SLOPE	VELOCITY	VELOCITY HEAD	LOSS COEFFICIENT	LOSSES	US WSE
1011.02	LINE D2	24	49.71	10.39	226.22	0.0200	1006.08	1007.08	0.0021	3.3116	0.1700	1.5000	0.2550	1011.38

LINE D2

PIPE SIZING (SOFFIT CONTROL)														
DS WSE	SYSTEM	PIPE DIA.	PIPE LENGTH	Q (cfs)	K	PIPE SLOPE	DS INVERT	US INVERT	FRICTION SLOPE	VELOCITY	VELOCITY HEAD	LOSS COEFFICIENT	LOSSES	US WSE
1011.17	LINE D3	24	50.26	4.14	226.22	0.0100	1010.10	1010.60	0.0003	1.3195	0.0270	1.5000	0.0405	1011.23

APPENDIX E.4: LINE A STORM DRAIN SYSTEMS

LINE A

PIPE SIZING (SOFFIT CONTROL)

DS WSE	SYSTEM	PIPE DIA.	PIPE LENGTH	Q (cfs)	K	PIPE SLOPE	DS INVERT	US INVERT	FRICTION SLOPE	VELOCITY	VELOCITY HEAD	LOSS COEFFICIENT	LOSSES	US WSE
1027.84	LINE A	30	238.83	8.89	410.16	0.0050	1024.00	1025.19	0.0005	1.8134	0.0510	1.5000	0.0765	1028.03

LOSS		
TRANSITION STRUCTURE	0.25	0.25
WALL ENTRANCE	0.25	0.25
JUNCTION STRUCTURE	0.50	1.00
		2.50

APPENDIX E.5: LINE B STORM DRAIN SYSTEMS

LINE B

PIPE SIZING (SOFFIT CONTROL)														
DS WSE	SYSTEM	PIPE DIA.	PIPE LENGTH	Q (cfs)	K	PIPE SLOPE	DS INVERT	US INVERT	FRICTION SLOPE	VELOCITY	VELOCITY HEAD	LOSS COEFFICIENT	LOSSES	US WSE
1026.79	LINE B	42	25.39	20.53	1006.08	0.0100	1022.50	1022.75	0.0004	2.1366	0.0708	1.5000	0.1061	1026.91
1026.91	LINE B	24	152.77	8.31	226.22	0.0100	1022.75	1024.28	0.0013	2.6486	0.1087	1.5000	0.1631	1027.28

LOSS		
TRANSITION STRUCTURE	0.25	0.25
WALL ENTRANCE	0.25	0.25
JUNCTION STRUCTURE	0.50	1.00
		2.50

LAT B1

PIPE SIZING (SOFFIT CONTROL)														
DS WSE	SYSTEM	PIPE DIA.	PIPE LENGTH	Q (cfs)	K	PIPE SLOPE	DS INVERT	US INVERT	FRICTION SLOPE	VELOCITY	VELOCITY HEAD	LOSS COEFFICIENT	LOSSES	US WSE
1026.91	LAT B1	42	492.53	11.48	1006.08	0.0030	1022.75	1024.23	0.0001	1.1948	0.0221	1.5000	0.0332	1027.00

LINE B2

PIPE SIZING (SOFFIT CONTROL)														
DS WSE	SYSTEM	PIPE DIA.	PIPE LENGTH	Q (cfs)	K	PIPE SLOPE	DS INVERT	US INVERT	FRICTION SLOPE	VELOCITY	VELOCITY HEAD	LOSS COEFFICIENT	LOSSES	US WSE
1022.94	LINE B2	42	350.79	66.78	1006.08	0.0050	1020.00	1021.75	0.0044	6.9501	0.7487	1.5000	1.1231	1025.61

LINE B3

PIPE SIZING (SOFFIT CONTROL)														
DS WSE	SYSTEM	PIPE DIA.	PIPE LENGTH	Q (cfs)	K	PIPE SLOPE	DS INVERT	US INVERT	FRICTION SLOPE	VELOCITY	VELOCITY HEAD	LOSS COEFFICIENT	LOSSES	US WSE
1022.94	LINE B3	24	146.94	7.14	226.22	0.0050	1020.00	1020.73	0.0010	2.2757	0.0803	1.5000	0.1204	1023.21

LINE B4

PIPE SIZING (SOFFIT CONTROL)														
DS WSE	SYSTEM	PIPE DIA.	PIPE LENGTH	Q (cfs)	K	PIPE SLOPE	DS INVERT	US INVERT	FRICTION SLOPE	VELOCITY	VELOCITY HEAD	LOSS COEFFICIENT	LOSSES	US WSE
1022.94	LINE B4	42	143.93	13.23	1006.08	0.0050	1020.00	1020.72	0.0002	1.3769	0.0294	1.5000	0.0441	1023.01

LINE B5

PIPE SIZING (SOFFIT CONTROL)														
DS WSE	SYSTEM	PIPE DIA.	PIPE LENGTH	Q (cfs)	K	PIPE SLOPE	DS INVERT	US INVERT	FRICTION SLOPE	VELOCITY	VELOCITY HEAD	LOSS COEFFICIENT	LOSSES	US WSE
1019.49	LINE B5	48	107.46	84.67	1436.42	0.0200	1016.00	1018.15	0.0035	6.7466	0.7055	1.5000	1.0583	1020.92

LINE B6

PIPE SIZING (SOFFIT CONTROL)														
DS WSE	SYSTEM	PIPE DIA.	PIPE LENGTH	Q (cfs)	K	PIPE SLOPE	DS INVERT	US INVERT	FRICTION SLOPE	VELOCITY	VELOCITY HEAD	LOSS COEFFICIENT	LOSSES	US WSE
1019.49	LINE B6	24	149.95	12.58	226.22	0.0100	1016.00	1017.50	0.0031	4.0096	0.2492	1.5000	0.3738	1020.33

LINE B7

PIPE SIZING (SOFFIT CONTROL)														
DS WSE	SYSTEM	PIPE DIA.	PIPE LENGTH	Q (cfs)	K	PIPE SLOPE	DS INVERT	US INVERT	FRICTION SLOPE	VELOCITY	VELOCITY HEAD	LOSS COEFFICIENT	LOSSES	US WSE
1019.49	LINE B7	24	146.96	12.28	226.22	0.0100	1016.00	1017.47	0.0029	3.9140	0.2374	1.5000	0.3562	1020.28

LINE B8

PIPE SIZING (SOFFIT CONTROL)														
DS WSE	SYSTEM	PIPE DIA.	PIPE LENGTH	Q (cfs)	K	PIPE SLOPE	DS INVERT	US INVERT	FRICTION SLOPE	VELOCITY	VELOCITY HEAD	LOSS COEFFICIENT	LOSSES	US WSE
1019.49	LINE B8	30	143.97	12.30	410.16	0.0100	1016.00	1017.44	0.0009	2.5090	0.0976	1.5000	0.1464	1019.77

LINE B9

PIPE SIZING (SOFFIT CONTROL)														
DS WSE	SYSTEM	PIPE DIA.	PIPE LENGTH	Q (cfs)	K	PIPE SLOPE	DS INVERT	US INVERT	FRICTION SLOPE	VELOCITY	VELOCITY HEAD	LOSS COEFFICIENT	LOSSES	US WSE
1017.86	LINE B9	30	86.71	17.18	410.16	0.0100	1014.70	1015.57	0.0018	3.5045	0.1904	1.5000	0.2855	1018.30

APPENDIX E.6: LINE E AND LINE F STORM DRAIN SYSTEMS

Worksheet for Line E

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00600	ft/ft
Diameter	1.50	ft
Discharge	4.19	ft³/s

Results

Normal Depth	0.76	ft
Flow Area	0.90	ft²
Wetted Perimeter	2.38	ft
Hydraulic Radius	0.38	ft
Top Width	1.50	ft
Critical Depth	0.78	ft
Percent Full	50.9	%
Critical Slope	0.00548	ft/ft
Velocity	4.64	ft/s
Velocity Head	0.33	ft
Specific Energy	1.10	ft
Froude Number	1.05	
Maximum Discharge	8.75	ft³/s
Discharge Full	8.14	ft³/s
Slope Full	0.00159	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	50.87	%
Downstream Velocity	Infinity	ft/s

Worksheet for Line E

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.76	ft
Critical Depth	0.78	ft
Channel Slope	0.00600	ft/ft
Critical Slope	0.00548	ft/ft

Worksheet for Line F

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00500	ft/ft
Diameter	2.50	ft
Discharge	29.00	ft³/s

Results

Normal Depth	2.05	ft
Flow Area	4.31	ft²
Wetted Perimeter	5.66	ft
Hydraulic Radius	0.76	ft
Top Width	1.92	ft
Critical Depth	1.84	ft
Percent Full	82.0	%
Critical Slope	0.00632	ft/ft
Velocity	6.74	ft/s
Velocity Head	0.70	ft
Specific Energy	2.75	ft
Froude Number	0.79	
Maximum Discharge	31.20	ft³/s
Discharge Full	29.00	ft³/s
Slope Full	0.00500	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	81.96	%
Downstream Velocity	Infinity	ft/s

Worksheet for Line F

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	2.05	ft
Critical Depth	1.84	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00632	ft/ft

APPENDIX E.7: PRELIMINARY BASIN OUTLET STRUCTURE SIZING

INFILTRATION BASIN A

100-YEAR BASIN OUTLET STRUCTURE SIZING

WEIR INVERT ELEVATION= 1027
MAXIMUM DEPTH 100-YEAR CAN POND= 1028
RESULTING MAXIMUM H = 1 ft

WEIR EQUATION: $Q = CLH^{(3/2)}$

SOLVING FOR L: $L = \frac{Q}{CH^{(3/2)}}$

Q = 11.48 ft^3/s
H = 1 ft
C = 3

L_{MIN} = 3.83 ft

100-YEAR WSE CALCULATION

WEIR EQUATION: $Q = CLH^{(3/2)}$

SOLVING FOR H: $H = \frac{Q}{CL}^{(2/3)}$

Q = 11.48 ft^3/s
L = 5 ft
C = 3

H = 0.84 ft

WEIR INVERT = 1027
100-YEAR WSE = **1027.84**

INFILTRATION BASIN B1

100-YEAR BASIN OUTLET STRUCTURE SIZING

WEIR INVERT ELEVATION= 1025.5
MAXIMUM DEPTH 100-YEAR CAN POND= 1027
RESULTING MAXIMUM H = 1.5 ft

WEIR EQUATION: $Q = CLH^{(3/2)}$

SOLVING FOR L: $L = \frac{Q}{CH^{(3/2)}}$

Q = 66.07 ft^3/s
H = 1.5 ft
C = 3

L_{MIN} = 11.99 ft

100-YEAR WSE CALCULATION

WEIR EQUATION: $Q = CLH^{(3/2)}$

SOLVING FOR H: $H = \frac{Q}{CL}^{(2/3)}$

Q = 66.07 ft^3/s
L = 15 ft
C = 3

H = 1.29 ft

WEIR INVERT = 1025.5
100-YEAR WSE = **1026.79**

INFILTRATION BASIN B2

100-YEAR BASIN OUTLET STRUCTURE SIZING

WEIR INVERT ELEVATION= 1022
MAXIMUM DEPTH 100-YEAR CAN POND= 1023
RESULTING MAXIMUM H = 1 ft

WEIR EQUATION: $Q = CLH^{(3/2)}$

SOLVING FOR L: $L = \frac{Q}{CH^{(3/2)}}$

Q = 108.67 ft^3/s
H = 1 ft
C = 3

L_{MIN} = 36.22 ft

100-YEAR WSE CALCULATION

WEIR EQUATION: $Q = CLH^{(3/2)}$

SOLVING FOR H: $H = \frac{Q}{CL}^{(2/3)}$

Q = 108.67 ft^3/s
L = 40 ft
C = 3

H = 0.94 ft

WEIR INVERT = 1022
100-YEAR WSE = **1022.94**

INFILTRATION BASIN B3

100-YEAR BASIN OUTLET STRUCTURE SIZING

WEIR INVERT ELEVATION= 1018

MAXIMUM DEPTH 100-YEAR CAN POND= 1019.5

RESULTING MAXIMUM H = 1.5 ft

WEIR EQUATION: $Q = CLH^{(3/2)}$

SOLVING FOR L: $L = \frac{Q}{CH^{(3/2)}}$

Q = 136.72 ft^3/s

H = 1.5 ft

C = 3

L_{MIN} = 24.81 ft

100-YEAR WSE CALCULATION

WEIR EQUATION: $Q = CLH^{(3/2)}$

SOLVING FOR H: $H = \frac{Q}{CL}^{(2/3)}$

Q = 136.72 ft^3/s

L = 25 ft

C = 3

H = 1.49 ft

WEIR INVERT = 1018

100-YEAR WSE = **1019.49**

INFILTRATION BASIN B4

100-YEAR BASIN OUTLET STRUCTURE SIZING

WEIR INVERT ELEVATION= 1017
MAXIMUM DEPTH 100-YEAR CAN POND= 1019
RESULTING MAXIMUM H = 2 ft

WEIR EQUATION: $Q = CLH^{(3/2)}$

SOLVING FOR L: $L = \frac{Q}{CH^{(3/2)}}$

Q = 19.08 ft^3/s
H = 2 ft
C = 3

L_{MIN} = 2.25 ft

100-YEAR WSE CALCULATION

WEIR EQUATION: $Q = CLH^{(3/2)}$

SOLVING FOR H: $H = \frac{Q}{CL}^{(2/3)}$

Q = 19.08 ft^3/s
L = 8 ft
C = 3

H = 0.86 ft

WEIR INVERT = 1017
100-YEAR WSE = **1017.86**

SUBSURFACE BASIN C OUTLET

100-YEAR BASIN OUTLET STRUCTURE SIZING

WEIR INVERT ELEVATION= 1010

MAXIMUM DEPTH 100-YEAR CAN POND= 1010.75

RESULTING MAXIMUM H = 0.75 ft

WEIR EQUATION: $Q = CLH^{(3/2)}$

SOLVING FOR L: $L = \frac{Q}{CH^{(3/2)}}$

Q = 29.81 ft^3/s

H = 0.75 ft

C = 3

L_{MIN} = 15.30 ft

100-YEAR WSE CALCULATION

WEIR EQUATION: $Q = CLH^{(3/2)}$

SOLVING FOR H: $H = \frac{Q}{CL}^{(2/3)}$

Q = 29.81 ft^3/s

L = 16 ft

C = 3

H = 0.73 ft

WEIR INVERT = 1010

100-YEAR WSE = **1010.73**

APPENDIX F: INCREASED RUNOFF MITIGATION

APPENDIX F.1: INFILTRATION BASIN STORAGE VOLUME TABLES

INFILTRATION BASIN "A" VOLUME

Contour Elevation	Contour Area (sf)	Contour Area (ac)	Contour Interval Volume (ac-ft)	Total Basin Volume (ac-ft)	Total Basin Volume (cu. ft.)
1022.50	7594.5	0.174		0.0000	
			0.091		
1023.00	8308.40	0.191		0.0912	3974.38
			0.207		
1024.00	9778.7	0.224		0.2986	
			0.242		
1025.00	11305.55	0.260		0.5404	23540.85
			0.278		
1026.00	12888.94	0.296		0.8179	35629.45
			0.315		
1027.00	**14528.89**	**0.334**		**1.1325**	**49330.18**
			0.353		
1028.00	16225.38	0.372		1.4853	64699.52
			0.392		
1029.00	17978.42	0.413		1.8777	81793.92
			0.433		
1030.00	19788.01	0.454		2.3111	100669.91

INFILTRATION BASIN "B1" VOLUME

Contour Elevation	Contour Area (sf)	Contour Area (ac)	Contour Interval Volume (ac-ft)	Total Basin Volume (ac-ft)	Total Basin Volume (cu. ft.)
1022.50	8968.1	0.206		0.0000	
			0.112		
1023.00	10649.12	0.244		0.1124	4898.28
			0.283		
1024.00	14089.62	0.323		0.3955	17227.59
			0.363		
1025.00	17623.11	0.405		0.7587	33051.04
1025.50			**0.446**	**0.9815**	**42754.95**
1026.00	21249.02	0.488		1.2043	52458.86
			0.530		
1027.00	24967.78	0.573		1.7342	75542.28

INFILTRATION BASIN "B2" VOLUME

Contour Elevation	Contour Area (sf)	Contour Area (ac)	Contour Interval Volume (ac-ft)	Total Basin Volume (ac-ft)	Total Basin Volume (cu. ft.)
1019.00	4467.2	0.103		0.0000	
			0.125		
1020.00	6442.60	0.148		0.1245	5424.86
			0.171		
1021.00	8480.43	0.195		0.2953	12863.08
			0.218		
1022.00	**10580.40**	**0.243**		**0.5136**	**22374.15**
			0.267		
1023.00	12742.51	0.293		0.7810	34018.87
			0.318		
1024.00	14966.76	0.344		1.0987	47858.60
			0.370		
1025.00	17253.14	0.396		1.4682	63955.01

INFILTRATION BASIN "B3" VOLUME

Contour Elevation	Contour Area (sf)	Contour Area (ac)	Contour Interval Volume (ac-ft)	Total Basin Volume (ac-ft)	Total Basin Volume (cu. ft.)
1016.00	13112.4	0.301		0.0000	
			0.345		
1017.00	16994.78	0.390		0.3446	15011.70
			0.435		
1018.00	**20940.35**	**0.481**		**0.7793**	**33944.97**
			0.526		
1019.00	24948.81	0.573		1.3053	56860.32
			0.619		
1020.00	29020.14	0.666		1.9242	83819.16
			0.713		
1021.00	33154.36	0.761		2.6374	114883.48

INFILTRATION BASIN "B4" VOLUME

Contour Elevation	Contour Area (sf)	Contour Area (ac)	Contour Interval Volume (ac-ft)	Total Basin Volume (ac-ft)	Total Basin Volume (cu. ft.)
1014.70	14766.6	0.339		0.0000	
			0.104		
1015.00	15307.31	0.351		0.1036	4510.84
			0.372		
1016.00	17138.76	0.393		0.4758	20725.25
			0.415		
1017.00	**19025.02**	**0.437**		**0.8907**	**38798.94**
			0.459		
1018.00	20966.07	0.481		1.3496	58786.63
			0.348		
1018.70	22374.09	0.514		1.6977	73953.01

APPENDIX F.2: SUBSURFACE SYSTEM STORAGE VOLUME TABLE

Subsurface System Volume Calculations - Subsurface System C

Increased Runoff Storage Volume

Elevation	96" Pipe Area Each (ft^2)	Pipe Area Total (ft^2)	96" Pipe Total Gross Volume at Elev. (ft^3)	Gross Cross Sectional Area of System (ft^2)	Net Gravel Area (ft^2)	Gravel Volume (ft^3)	Cumulative Subsurface System Volume (ft^3)	Cumulative Subsurface System Volume (ac-ft)	Cumulative Subsurface System Volume above 1010.0 (ft^3)	Subsurface System Volume above 1010.0 (ac-ft)	
1002	0	0	0	0	0	0	0	0	0	0.000	
1002.5	0	0	0	35.5	35.5	6390	6390	0.1467	0.0000	0.000	
1003	0	0	0	71	71	12780	12780	0.2934	0.0000	0.000	
1003.5	1.13	7.91	3559.5	106.5	98.59	17746.2	21305.7	0.4891	0.0000	0.000	
1004	3.63	25.41	11434.5	142	116.59	20986.2	32420.7	0.7443	0.0000	0.000	
1004.5	6.52	45.64	20538	177.5	131.86	23734.8	44272.8	1.0164	0.0000	0.000	
1005	9.83	68.81	30964.5	213	144.19	25954.2	56918.7	1.3067	0.0000	0.000	
1005.5	13.42	93.94	42273	248.5	154.56	27820.8	70093.8	1.6091	13175.10	0.000	Storage Volume Below Weir at 1010.00 is 133,471 Cu. Ft.
1006	17.22	120.54	54243	284	163.46	29422.8	83665.8	1.9207	26747.10	0.000	
1006.5	21.14	147.98	66591	319.5	171.52	30873.6	97464.6	2.2375	40545.90	0.000	
1007	25.13	175.91	79159.5	355	179.09	32236.2	111395.7	2.5573	54477.00	0.000	
1007.5	29.12	203.84	91728	390.5	186.66	33598.8	125326.8	2.8771	68408.10	0.320	
1008	33.05	231.35	104107.5	426	194.65	35037	139144.5	3.1943	82225.80	0.637	
1008.5	36.85	257.95	116077.5	461.5	203.55	36639	152716.5	3.5059	95797.80	0.949	
1009	40.44	283.08	127386	497	213.92	38505.6	165891.6	3.8083	108972.90	1.251	
1009.5	43.74	306.18	137781	532.5	226.32	40737.6	178518.6	4.0982	121599.90	1.541	
1010	**46.64**	**326.48**	**146916**	**568**	**241.52**	**43473.6**	**190389.6**	**4.3707**	**133470.90**	**1.813**	
1010.5	48.96	342.72	154224	603.5	260.78	46940.4	201164.4	4.6181	144245.70	2.061	
1011	50.27	351.89	158350.5	639	287.11	51679.8	210030.3	4.8216	153111.60	2.264	
1011.5	50.27	351.89	158350.5	674.5	322.61	58069.8	216420.3	4.9683	159501.60	2.411	
1012	50.27	351.89	158350.5	710	358.11	64459.8	222810.3	5.1150	165891.60	2.558	

APPENDIX F.3: REQUIRED STORAGE VOLUMES TO MITIGATE INCREASED RUNOFF

Area AB Required Mitigation Volume Calculation

Q_{EX} =	25.57 cfs
Q_{POST}=	70.95 cfs

Locations on both sides of the post project hydrograph where the closest flow rate to the existing condition flow rate (without being greater) occurs:

Time	Volume	Flow Rate
16+00	6.1164	20.88
16+35	8.3591	24.28

Difference in Volume =	2.2427 ac-ft
Maximum Peak Outflow =	24.28 cfs
Total Available Volume =	4.2512 ac-ft

Area CD Required Mitigation Volume Calculation

Q_{EX} =	29.81 cfs
Q_{POST}=	77.59 cfs

Locations on both sides of the post project hydrograph where the closest flow rate to the existing condition flow rate (without being greater) occurs:

Time	Volume	Flow Rate
16+00	5.987	24.24
16+25	7.757	26.79

Difference in Volume =	1.77 ac-ft
Maximum Peak Outflow =	24.24 cfs
Total Available Volume =	3.4081 ac-ft

APPENDIX F.4: VOLUME SUMMARY TABLE

AREA AB

DMA/ Basin	Weir Flow Line Elevation	Basin Volume Below Weir Flow Line Elevation (ft^3)	Basin Volume Below Weir Flow Line Elevation (ac-ft)	Total Available Mitigation Vol. (ac-ft)	Total Req'd Mitigation Vol (ac-ft) (see discussion below)
A	1027	49,330	1.1325	4.2976	2.2427
B1	1025.5	42,755	0.9815		
B2	1022	22,374	0.5136		
B3	1018	33,945	0.7793		
B4	1017	38,799	0.8907		

AREA CD

DMA/ Basin	Weir Flow Line Elevation	Basin Volume Below Weir Flow Line Elevation (ft^3)	Basin Volume Below Weir Flow Line Elevation (ac-ft)	Total Available Mitigation Vol. (ac-ft)	Total Req'd Mitigation Vol (ac-ft) (see discussion below)
C [1]	1010	133,471	1.813	1.813	1.77

1 – NOTE: Basin C includes DMAs C and D. Since Basin C is subsurface, the water quality volume was not accounted for in the available storage volume (i.e. volume below elevation 1010.00 was not included in the increased runoff mitigation calculation) in order to be conservative during the preliminary stages. The system will be maximized during final engineering.

EXCERPTS

EXCERPT A: SAN BERNARDINO COUNTY LAND USE PLAN

See FH21 A

See FH28 A

See FH30 A

CITY OF FONTANA

CITY OF RIALTO

CITY OF FONTANA

SPEEDWAY RDA

SPEEDWAY RDA

SPEEDWAY RDA

Kaiser Hospital

Green Acres Memorial Gardens

Green Acres Lake

Jurupa Mountains

HISTORIC ROUTE 66 HWY

ARROW RTE

See FH29A - Inset 1

See FH29A - Inset 2

See FH29A - Inset 3

See FH29A - Inset 4

R6W R5W

T1N T1S T2S

Land Use Zoning Districts

AG – Agriculture
CG – General Commercial
CH – Highway Commercial
CN – Neighborhood Commercial
CO – Office Commercial
CR – Rural Commercial
CS – Service Commercial
FW – Floodway
IC – Community Industrial
IN – Institutional
IR – Regional Industrial
OS – Open Space
RC – Resource Conservation
RL – Rural Living
RM – Multiple Residential
RS – Single Residential
SD – Special Development
SP – Specific Plan

County designated Land Use Zoning Districts do not apply to Federal or State owned property.

San Bernardino County Land Use Plan
GENERAL PLAN
Land Use Zoning Districts

SCALE 1:14,400

1,250 625 0 1,250 2,500 3,750 5,000 Feet

0.5 0.25 0 0.5 1 Miles

Legend

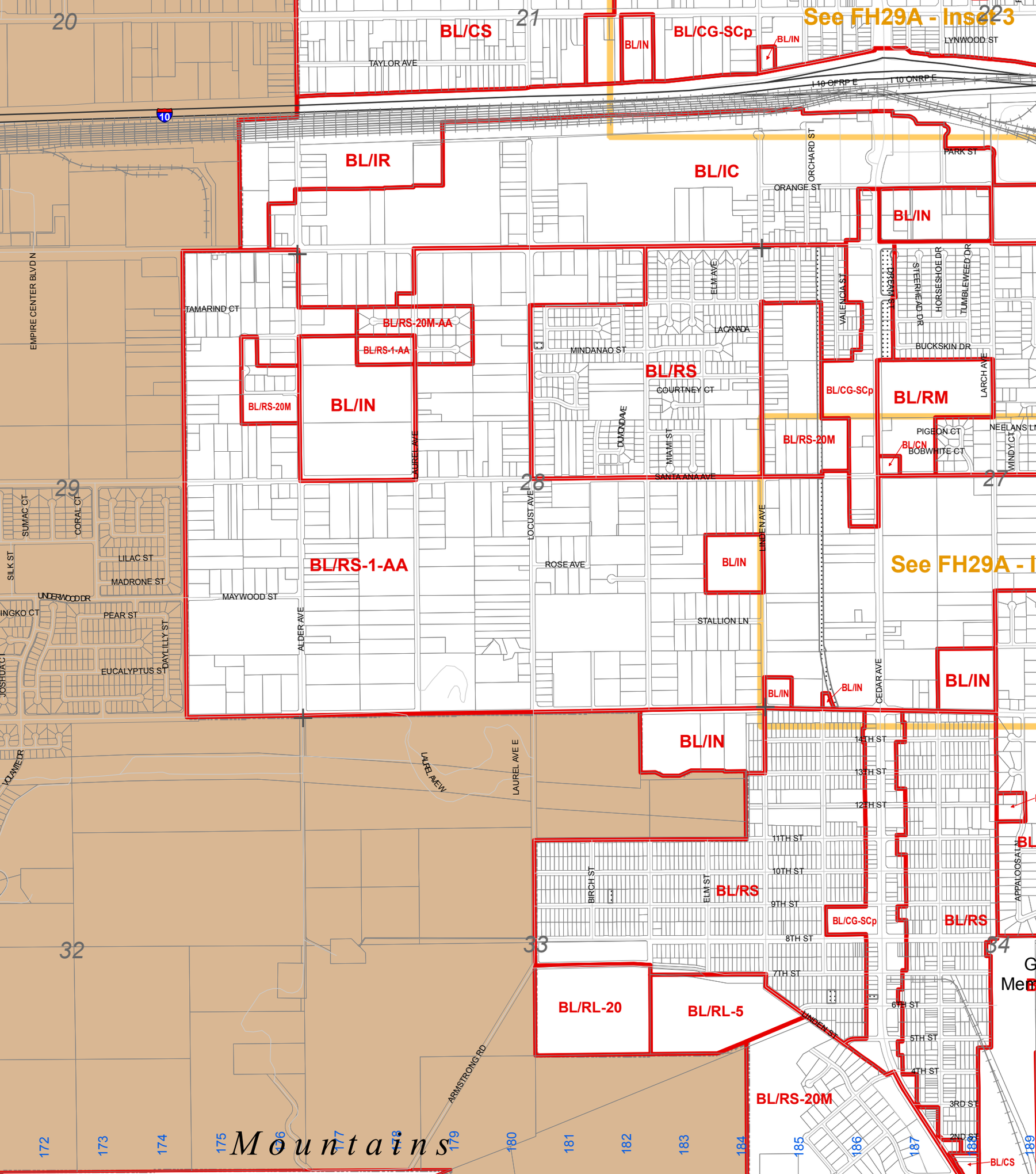
- BLM
- National Park
- National Forest
- Military
- State
- Indian Land
- Other Federal Government
- County
- Private Unincorporated
- RDA

Jurisdictional Control data is for informational purposes only and is not part of the General Plan Land Use Zoning. The depiction of the various land ownership categories is the best available information but cannot be guaranteed accurate. For current land ownership information please contact the San Bernardino County Assessor's Office.

SAN BERNARDINO COUNTY MAP LOCATION

FH29 A
Fontana

Z:\Projects\Work\Flatt\GenPlan\LUDs\Maps\New LUDs_Detail3.mxd
Map Date: 04/22/2010


See FH29A - Inset
BL/CS
BL/IN
BL/CG-SCp
BL/IR
BL/IC
BL/RS-20M-AA
BL/RS-1-AA
BL/RS-20M
BL/RS
BL/RM
BL/CN
BL/RS-1-AA
BL/RL-20
BL/RL-5
See FH29A - I
TAYLOR AVE
LYNWOOD ST
I-10 OFRP E
I-10 ONRP E
PARK ST
ORCHARD ST
ORANGE ST
EMPIRE CENTER BLVD N
TAMARIND CT
ELM AVE
VALENCIA ST
DREAM ST
STEEPLECHASE DR
HORSESHOE DR
TUMBLEWEED DR
LACANADA
MINDANAO ST
BUCKSKIN DR
COURTNEY CT
LARCH AVE
LAUREL AVE
DUONDA AVE
MIAMI ST
PIGEON CT
BOBWHITE CT
WINDY CT
NEELANS LN
SANTA ANA AVE
SUMAC CT
CORAL CT
LILAC ST
MADRONE ST
SILK ST
UNDERWOOD DR
PEAR ST
EUCALYPTUS ST
DAYLILLY ST
JOSHUA CT
MAYWOOD ST
ALDER AVE
LOCUST AVE
ROSE AVE
LINDEN AVE
STALLION LN
CEDAR AVE
VOLUNTEER
LAUREL AVE E
LAUREL AVE
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13TH ST
12TH ST
11TH ST
10TH ST
9TH ST
8TH ST
7TH ST
6TH ST
5TH ST
4TH ST
3RD ST
2ND ST
BIRCH ST
ELM ST
APPALOOSA LN
ARMSTRONG RD
LINDEN ST
Mountains
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EXCERPT B: CITY OF FONTANA GENERAL PLAN LAND USE MAP

City of Fontana, State of California

GENERAL PLAN LAND USE MAP

Adopted: October 21, 2003
Last Revised: May 10, 2010

GENERAL PLAN LAND USE LEGEND

RESIDENTIAL DESIGNATIONS

- R-E Residential Estates (2 du/ac)
- R-PC Residential Planned Community (3.0-6.4 du/ac)
- R-SF Single Family Residential (2.1-5 du/ac)
- R-M Medium Density Residential (5.1-7.6 du/ac for single-family detached product type; 7.7-12 du/ac for single family attached or multiple family product type)
- R-MF Multi Family Residential (12.1-24 du/ac)

COMMERCIAL DESIGNATIONS

- C-C Community Commercial (0.1-1.0 FAR)
- C-G General Commercial (0.1-1.0 FAR)
- RMU Regional Mixed Use (0.1-1.0 FAR for non-residential; 12-24 du/acre for residential)

INDUSTRIAL DESIGNATIONS

- I-L Light Industrial (0.1-0.6)
- I-G General Industrial (0.1-0.6 FAR)

PUBLIC DESIGNATIONS

- P-PF Public Facilities
- P-R Recreational Facilities
- P-UC Public Utility Corridors

OPEN SPACE DESIGNATIONS

- OS Open Space

SPECIFIC PLAN LEGEND

- #1 Southridge Village
- #2 Rancho Fontana
- #3 Walnut Village
- #4 Rescinded
- #5 Southwest Industrial Park
- #6 Northgate
- #7 Rescinded
- #8 West End
- #9 Fontana Gateway
- #10 Rescinded
- #11 South Park
- #12 Hunters Ridge
- #13 Empire Center
- #14 Rescinded
- #15 California Landings
- #16 Sierra Lakes
- #17 Westgate
- #18 Summit Heights
- #19 Coyote Canyon
- #20 Citrus Heights South
- #21 Citrus Heights North
- #22 Summit at Rosena
- #23 Ventana at Duncan Canyon
- #24 Valley Trails
- #25 Fontana Promenade
- #26 Providence Pointe
- #27 Arboretum

- City Limit
- Sphere of Influence
- Parcel
- Easement
- City Address Block
- Specific Plans
- C Civic Use
- CH City Hall
- F Fire Station
- H Hospital
- P Police Dept
- S School
- Activity Center Overlay (0.1-1.0 FAR for non-residential uses; 7.7-24 du/acre for residential uses)
- Downtown Overlay
- Boulevard Overlay (0.1-1.0 FAR for non-residential uses; 7.7-24 du/acre for residential uses)
- Auto Center Overlay (138 acres)

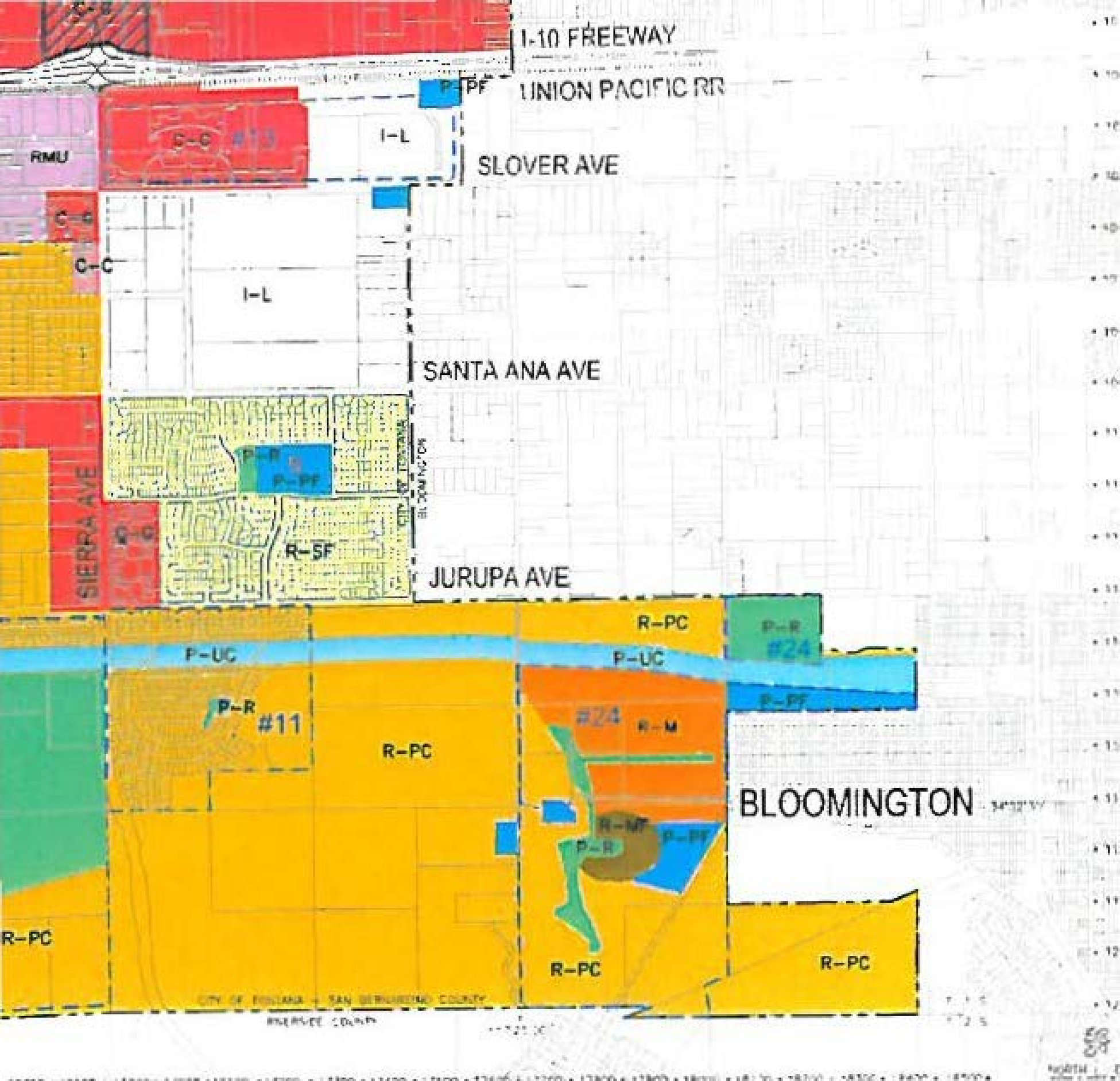
SEAL OF THE CITY OF FONTANA, CALIFORNIA

Scale
~~1: 24000~~
~~1 inch = 2000 feet~~
0 2000 4000 feet

General Plan Amendments

GPA No.	Resolution No.	Adoption Date
GPLU Map Adopted	03-163	10/21/03
04-006	04-168	09/21/04
04-009	04-208	12/07/04
04-002	05-008	02/01/05
04-008	05-160	09/20/05
Dev Code Amend No 04-04	Ord 1493	10/04/05
05-004, 06-002	06-80	05/09/06
05-005	06-136	07/11/06
06-01, 06-07	06-224	09/26/06
06-004, 005, 008, 014	06-281	12/12/06
06-010	07-34	03/27/07
06-012	07-53	05/08/07
07-004, 06-009, 06-018	07-151	11/13/07
07-009 and 07-010	08-128	10/14/08
08-09	08-154	12/09/08
08-12	08-155	12/09/08
06-006	09-90	09/23/09
09-002	09-99	11/11/09
09-005	09-100	11/11/09
09-008	10-09	02/10/10
09-015	10-12	03/10/10

City of Fontana
Department of Engineering / GIS


I-10 FREEWAY
UNION PACIFIC RR
SLOVER AVE
SANTA ANA AVE
JURUPA AVE
SIERRA AVE
BLOOMINGTON
C-C
I-L
RMU
R-SF
R-PC
R-M
R-MF
P-R
P-PF
P-UC
#11
#13
#24

EXCERPT C: LAG TIME CALCULATION TECHNICAL MEMORANDUM

Memorandum of Understanding

Date: **June 20, 2018**

To: **Xochitl Lozano, County of San Bernardino**

From: **Joseph L. Castaneda, P.E.**

Re: **Bloomington Commerce Center Pre-Project Condition Lag Time Calculation**

The unit hydrograph calculations for the post-project condition were prepared based upon the onsite area tributary to the two outlets for the project site (the Line 1 and Line 2 systems). Preparing pre-project unit hydrographs to represent the same area can pose a challenge since the post-project boundaries do not line up with pre-project boundaries and flow paths due to grading, buildings, and other onsite facilities. Typical practice is to perform pre-project unit hydrograph calculations using the post-project area and parameters, and changing the land use in order to compare the same area in the pre-project and post-project conditions. However, the issue of lag time can pose a challenge since pre-project rational method hydrology calculations cannot always be performed for the same area as in the post-project condition due to the delineated areas (i.e. there may be a ridge in the pre-project condition where flows cross in the post-project condition, etc.). Therefore, in order to adjust the lag time for the pre-project condition, a ratio was utilized based upon the Manning's "n" value.

The San Bernardino County Hydrology Manual (Section E.3 – Determination of Synthetic Distribution Graphs) discusses the lag time relationship. The empirical formula E.2 is given as:

$$\text{Lag (hours)} = C_t ((L * L_{ca}) / S^{0.5})^m$$

Where:

- C_t = a constant (determine by regional flood reconstitution studies)
- L = length of longest watercourse (miles)
- Lca = length along longest watercourse, measured upstream ot a point opposite center of area (miles).
- S = overall slope of drainage area between the headwaters and the collection point (feet per mile)
- m = a constant determine by regional flood reconstitution

The manual states on page E-7 that it is then assumed that there exists a relationship between watershed lag and the quotient $((L * L_{ca}) / S^{0.5})^m$ which is given by the above empirical formula for lag when:

C_t = 24 $\overline{n}$; ($\overline{n}$ is the visually estimated basin factor of all collection streams and watershed channels, see Figure E-2 in the hydrology manual)

m = 0.38

Since the only variable changing in the pre-project and post-project condition unit hydrograph calculations is the Manning's "n" value and it is a linear relationship, the pre-project lag time would therefore be:

$$\text{Lag (pre-project)} = \frac{0.030}{0.015} * \text{Lag (post-project)}$$

Where 0.030 represents the pre-project Manning's "n" value and 0.015 represents the post-project Manning's "n" value. The unit hydrograph calculations take the input of the time of concentration directly and calculate the lag time using the following formula:

Lag (minutes) = 0.8 Tc

Where Tc is the time of concentration. Therefore, to calculate the pre-project time of concentration, the post-project time of concentration was multiplied by the ratio of 0.03/0.015. The following table summarizes the calculations:

Time of Concentration and Lag Time Calculation

			Post-Project Condition	Pre-Project Condition	
	Watershed Area	100 Year Tc	100 Year Lag Time	100 Year TC	100 Year Lag Time
AREA AB	AB	18.94	15.152	37.88	30.304
AREA CD	CD	12.275	9.82	24.55	19.64

Time of Concentration and Lag Time Calculation

		Post Project Condition		Pre Project Condition	
	Watershed Area	100 Yr Tc	100 Yr Lag Time	100 Yr TC	100 Yr Lag Time
AREA AB	AB	18.94	15.152	37.88	30.304
AREA CD	CD	12.275	9.82	24.55	19.64

USACOE Lag Equation

$$\text{Lag (Hours)} = 24\ n\ [L * L_{ca}/S^{0.5}]^{0.38}$$

SBCFC Lag Equation

$$\text{Lag Hours} = 0.8 * T_c / 60$$

Pre-Project Lag Time adjusted from Post Project Condition to Pre Project Condition by using the ratio between the Manning "n" value. Post-Project Condition n=0.015, Pre-Project Condition n=0.03. Ratio between Pre-Project/Post-Project = 2 or 0.030/0.015

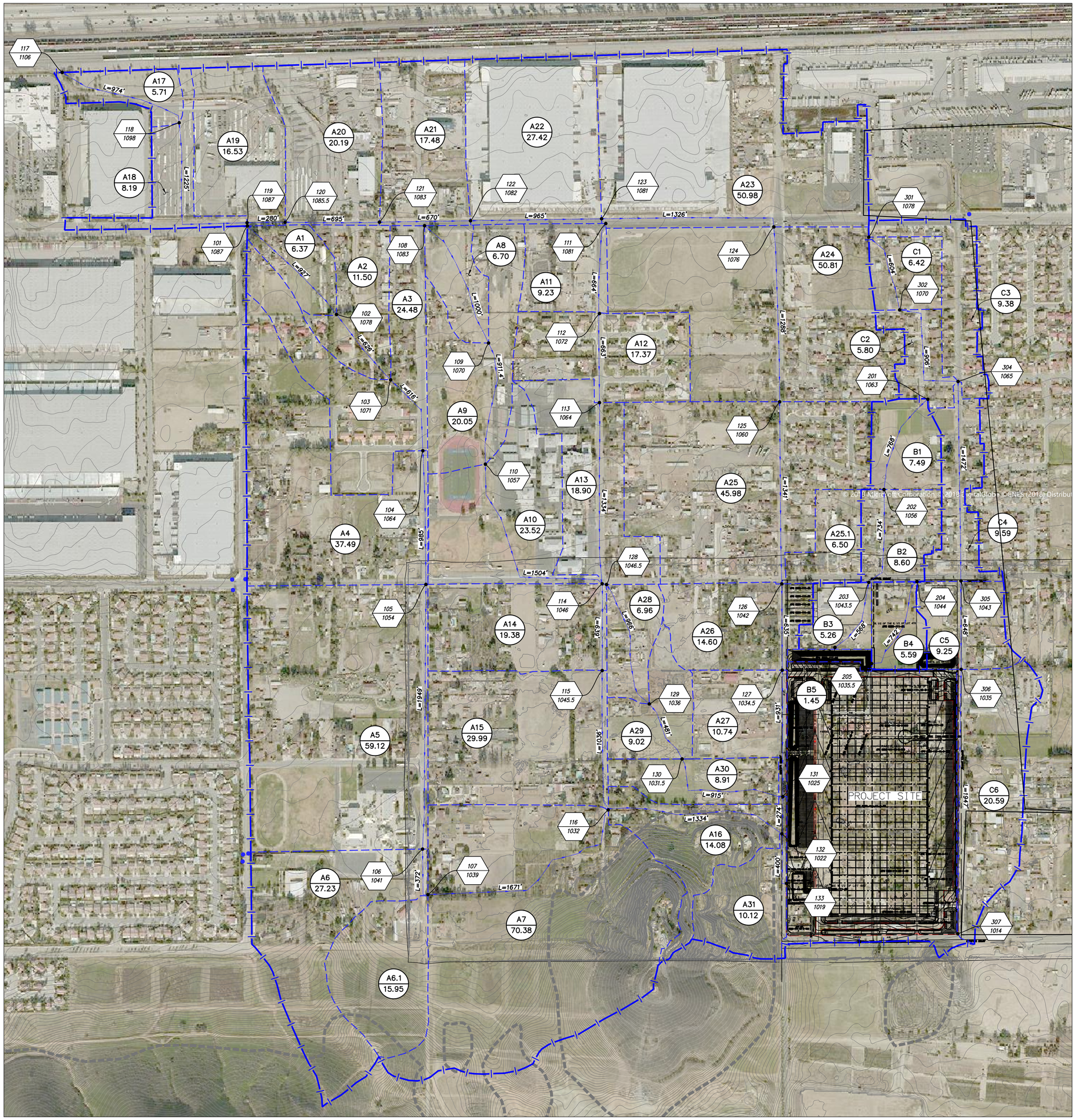
EXHIBITS

EXHIBIT A: ULTIMATE CONDITION OFFSITE RATIONAL METHOD HYDROLOGY MAP

BLOOMINGTON PROJECT

COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA

OFFSITE HYDROLOGY MAP



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LEGEND:

- X.X / X.X — NODE/CONCENTRATION POINT / FLOWLINE ELEVATION
- XXXX.X — APPROXIMATE INVERT ELEVATION
- XXX / X.X — SUB AREA / ACRES
- L=XXX' — FLOW DISTANCE
- FLOW PATH
- OFFSITE WATERSHED BOUNDARY
- OFFSITE WATERSHED SUB-BOUNDARY

N

GRAPHIC SCALE
300' 0 150' 300' 600'
1" = 300'

JLC Engineering & Consulting, Inc.
41660 IVY STREET, SUITE A
MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

EXHIBIT "A"

BLOOMINGTON COMMERCE

POST-PROJECT CONDITION
OFFSITE HYDROLOGY MAP

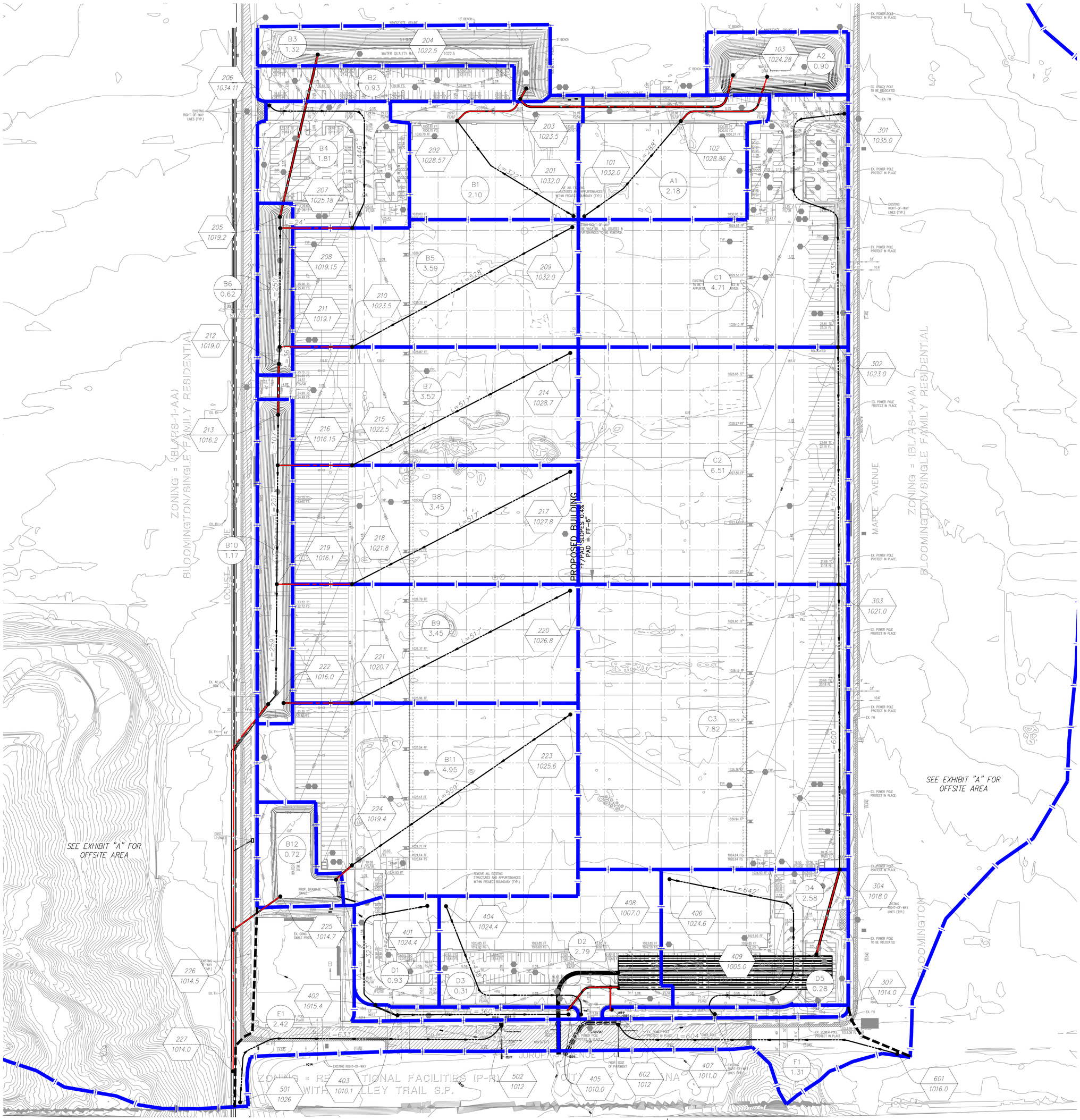
Drawing Name: O:\257.02.18\Engineering\Hydrology_Plan\Exhibits\POST-COND_HYDRO MAP-REV.dwg
Last Opened: Jul 27, 2020 - 4:49pm by jsorell

EXHIBIT B: **POST-PROJECT CONDITION ONSITE RATIONAL METHOD HYDROLOGY MAP**

BLOOMINGTON COMMERCE CENTER

COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA

POST PROJECT CONDITION - ON-SITE HYDROLOGY MAP



LEGEND:

XXX.X / XXXX	NODE/CONCENTRATION POINT / FLOWLINE ELEVATION
*XXXX.X	APPROXIMATE INVERT ELEVATION
XXX / X.X	SUB AREA / ACRES
L=XXX'	FLOW DISTANCE
	FLOW PATH

N

GRAPHIC SCALE
80' 0 40' 80' 160'
1" = 80'

EXHIBIT "B"

BLOOMINGTON COMMERCE

POST PROJECT CONDITION
ON-SITE HYDROLOGY MAP

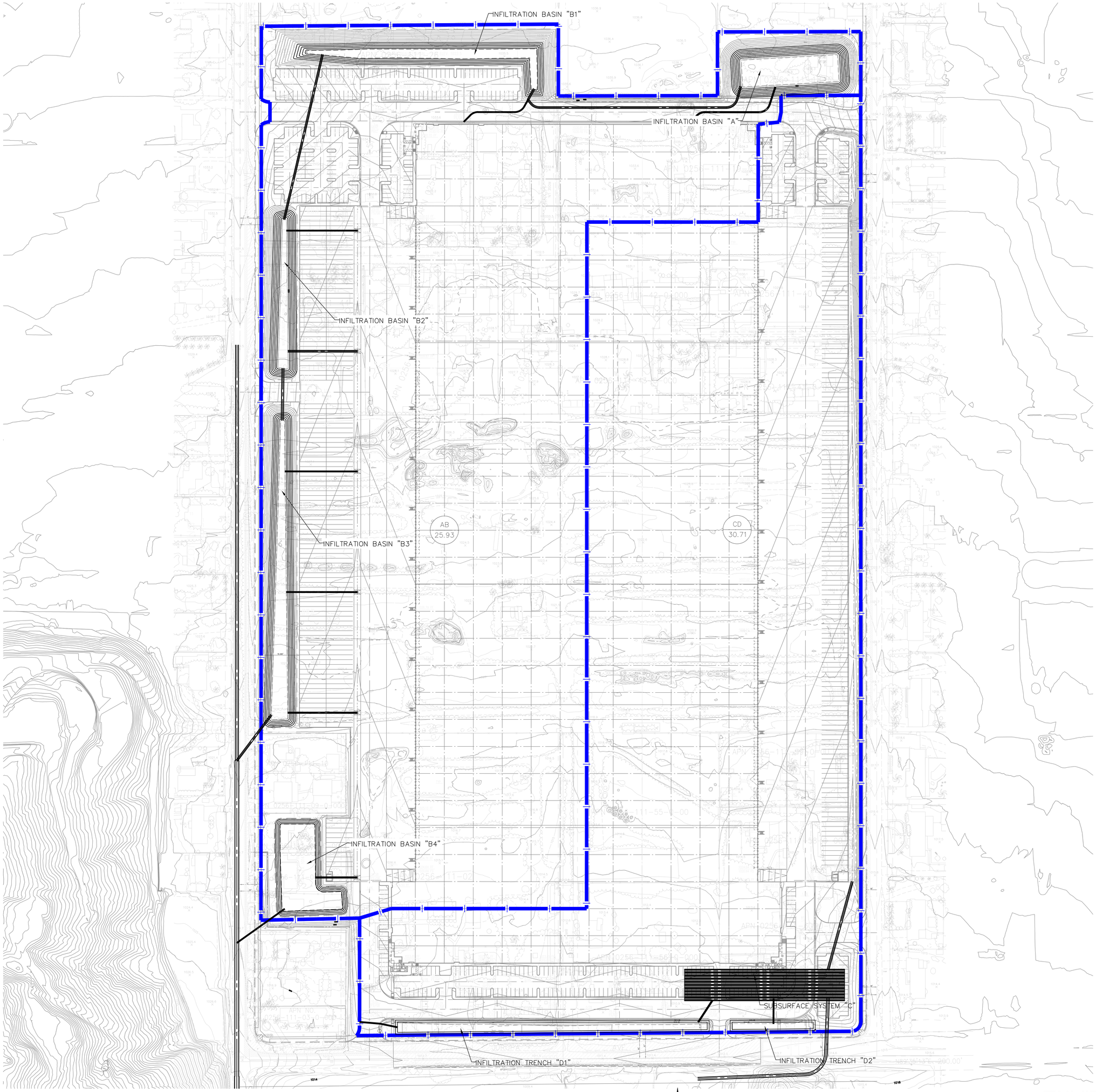
JLC Engineering & Consulting, Inc.
41660 IVY STREET, SUITE A
MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

EXHIBIT C: UNIT HYDROGRAPH WATERSHED MAP

BLOOMINGTON COMMERCE CENTER

COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA

UNIT HYDROGRAPH WATERSHED MAP



N

GRAPHIC SCALE

80' 0 40' 80' 160'

1" = 80'

JLC Engineering & Consulting, Inc.

41660 IVY STREET, SUITE A
MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

EXHIBIT "C"

BLOOMINGTON COMMERCE

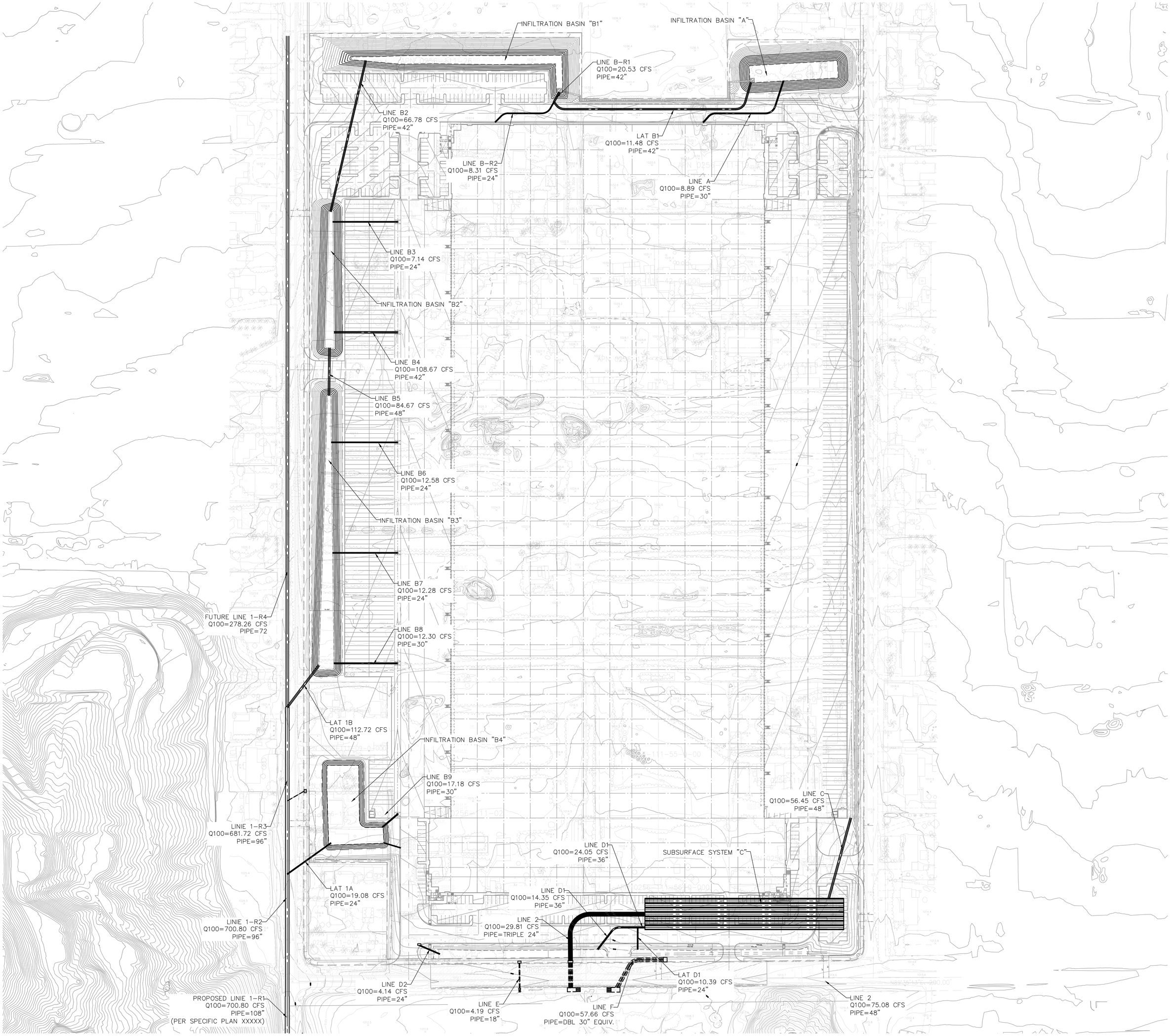
UNIT HYDRGRAPH
WATERSHED MAP

EXHIBIT D: DRAINAGE FACILITIES MAP

BLOOMINGTON COMMERCE CENTER

COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA

DRAINAGE FACILITIES MAP



N

GRAPHIC SCALE
80' 0 40' 80' 160'
1" = 80'

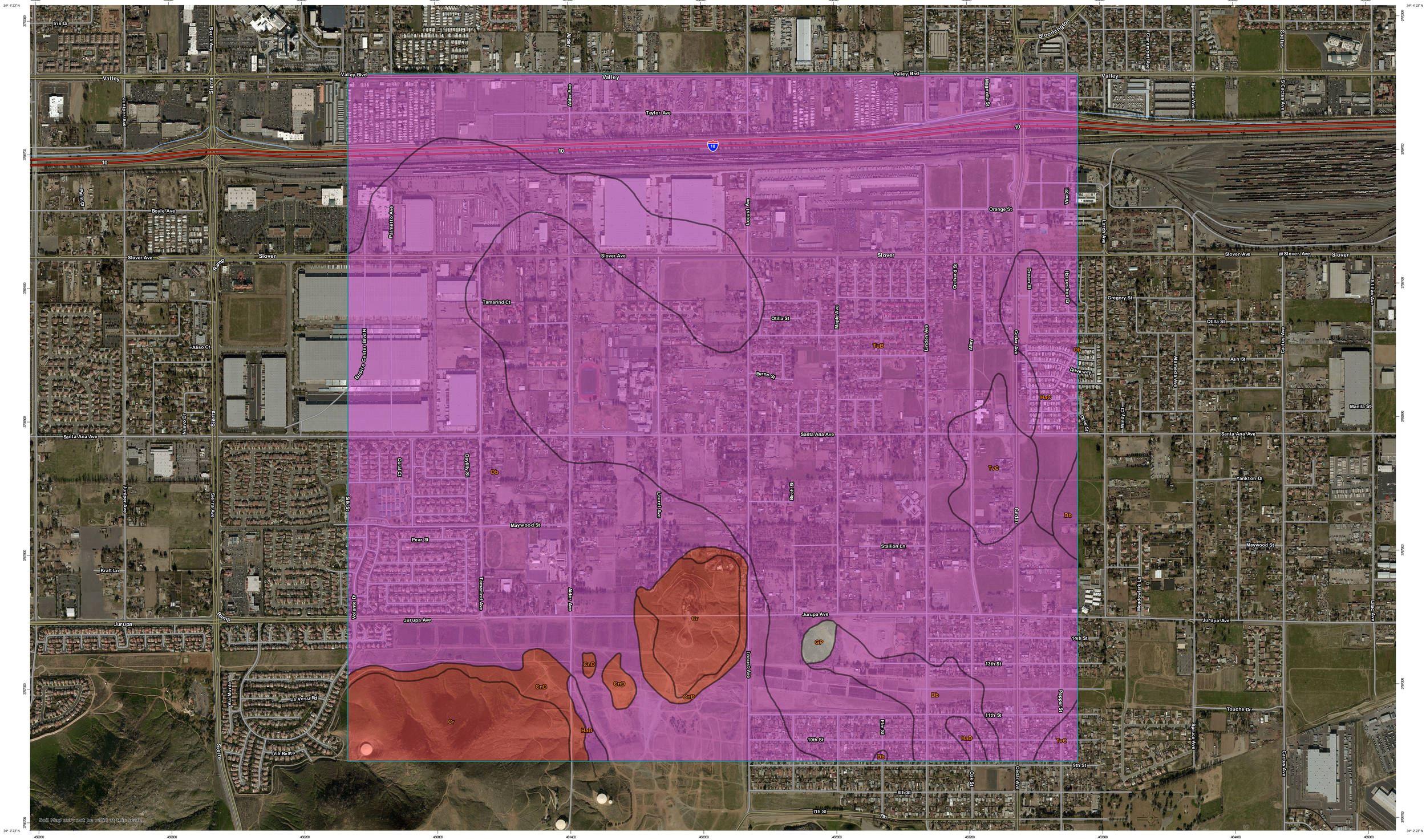
EXHIBIT "D"

BLOOMINGTON COMMERCE

DRAINAGE FACILITIES MAP

JLC Engineering & Consulting, Inc.
41660 IVY STREET, SUITE A
MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

EXHIBIT E: HYDROLOGIC SOILS MAP



Map Scale: 1:7,670 if printed on D landscape (34" x 22") sheet.

Meters: 0 100 200 400 600

Feet: 0 350 700 1400 2100

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: San Bernardino County Southwestern Part, California
Survey Area Data: Version 9, Sep 11, 2017

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

Date(s) aerial images were photographed: May 25, 2010—Jan 18, 2015

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CnD	Cieneba sandy loam, 9 to 15 percent slopes	D	50.9	2.0%
Cr	Cieneba-Rock outcrop complex, 30 to 50 percent slopes, MLRA 20	D	135.0	5.4%
Db	Delhi fine sand	A	800.6	31.8%
GP	Quarries and Pits soils		5.7	0.2%
HaC	Hanford coarse sandy loam, 2 to 9 percent slopes	A	61.6	2.4%
HaD	Hanford coarse sandy loam, 9 to 15 percent slopes	A	10.1	0.4%
TuB	Tujunga loamy sand, 0 to 5 percent slopes	A	1,397.1	55.5%
TvC	Tujunga gravelly loamy sand, 0 to 9 percent slopes	A	55.6	2.2%
Totals for Area of Interest			**2,516.6**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

EXHIBIT F: RAINFALL

NOAA Atlas 14, Volume 6, Version 2
Location name: Bloomington, California, USA*
Latitude: 34.0569°, Longitude: -117.3909°
Elevation: 1031.07 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.108 (0.090–0.131)	0.140 (0.117–0.170)	0.183 (0.151–0.222)	0.218 (0.179–0.268)	0.267 (0.212–0.339)	0.306 (0.238–0.397)	0.346 (0.262–0.460)	0.388 (0.286–0.532)	0.447 (0.316–0.640)	0.495 (0.337–0.735)
10-min	0.155 (0.129–0.188)	0.201 (0.167–0.244)	0.262 (0.217–0.318)	0.312 (0.257–0.383)	0.383 (0.304–0.486)	0.438 (0.341–0.569)	0.495 (0.376–0.660)	0.556 (0.410–0.762)	0.641 (0.453–0.918)	0.710 (0.484–1.05)
15-min	0.188 (0.156–0.227)	0.243 (0.202–0.295)	0.316 (0.263–0.385)	0.378 (0.311–0.464)	0.463 (0.368–0.588)	0.530 (0.412–0.688)	0.599 (0.454–0.798)	0.673 (0.496–0.922)	0.776 (0.548–1.11)	0.859 (0.585–1.27)
30-min	0.280 (0.233–0.339)	0.362 (0.301–0.440)	0.472 (0.392–0.575)	0.563 (0.464–0.692)	0.690 (0.549–0.877)	0.790 (0.614–1.03)	0.894 (0.678–1.19)	1.00 (0.739–1.38)	1.16 (0.817–1.66)	1.28 (0.873–1.90)
60-min	0.407 (0.340–0.494)	0.528 (0.439–0.640)	0.688 (0.571–0.837)	0.821 (0.675–1.01)	1.00 (0.799–1.28)	1.15 (0.895–1.49)	1.30 (0.987–1.73)	1.46 (1.08–2.00)	1.69 (1.19–2.41)	1.87 (1.27–2.77)
2-hr	0.595 (0.496–0.721)	0.764 (0.635–0.927)	0.986 (0.818–1.20)	1.17 (0.962–1.43)	1.42 (1.13–1.80)	1.61 (1.25–2.10)	1.81 (1.38–2.42)	2.02 (1.49–2.77)	2.31 (1.63–3.31)	2.55 (1.73–3.77)
3-hr	0.740 (0.617–0.897)	0.948 (0.789–1.15)	1.22 (1.01–1.49)	1.44 (1.19–1.77)	1.75 (1.39–2.22)	1.98 (1.54–2.57)	2.22 (1.68–2.96)	2.47 (1.82–3.39)	2.81 (1.99–4.03)	3.09 (2.10–4.58)
6-hr	1.04 (0.869–1.26)	1.34 (1.11–1.62)	1.72 (1.43–2.09)	2.03 (1.67–2.49)	2.44 (1.94–3.11)	2.77 (2.15–3.59)	3.09 (2.35–4.12)	3.43 (2.53–4.70)	3.89 (2.74–5.56)	4.25 (2.89–6.30)
12-hr	1.39 (1.16–1.68)	1.79 (1.49–2.17)	2.30 (1.91–2.80)	2.72 (2.24–3.34)	3.28 (2.61–4.16)	3.70 (2.88–4.81)	4.13 (3.13–5.50)	4.57 (3.37–6.27)	5.17 (3.65–7.40)	5.63 (3.84–8.35)
24-hr	1.85 (1.64–2.14)	2.41 (2.13–2.78)	3.13 (2.76–3.62)	3.71 (3.24–4.32)	4.48 (3.80–5.40)	5.07 (4.21–6.24)	5.66 (4.59–7.14)	6.27 (4.94–8.12)	7.08 (5.36–9.55)	7.71 (5.64–10.8)
2-day	2.25 (1.99–2.60)	2.98 (2.64–3.44)	3.93 (3.47–4.55)	4.70 (4.11–5.48)	5.74 (4.86–6.92)	6.54 (5.42–8.04)	7.35 (5.95–9.25)	8.18 (6.44–10.6)	9.30 (7.04–12.5)	10.2 (7.45–14.2)
3-day	2.41 (2.13–2.78)	3.25 (2.87–3.75)	4.34 (3.82–5.01)	5.23 (4.57–6.10)	6.45 (5.46–7.77)	7.39 (6.13–9.09)	8.36 (6.77–10.5)	9.36 (7.38–12.1)	10.7 (8.12–14.5)	11.8 (8.64–16.5)
4-day	2.59 (2.29–2.99)	3.52 (3.11–4.06)	4.74 (4.18–5.49)	5.75 (5.03–6.71)	7.13 (6.04–8.59)	8.21 (6.81–10.1)	9.31 (7.55–11.7)	10.5 (8.25–13.6)	12.0 (9.12–16.2)	13.3 (9.73–18.6)
7-day	2.96 (2.62–3.42)	4.07 (3.60–4.70)	5.53 (4.88–6.40)	6.74 (5.89–7.86)	8.40 (7.11–10.1)	9.70 (8.05–11.9)	11.0 (8.95–13.9)	12.5 (9.82–16.1)	14.4 (10.9–19.4)	15.9 (11.7–22.2)
10-day	3.22 (2.85–3.71)	4.45 (3.93–5.13)	6.07 (5.35–7.03)	7.42 (6.49–8.65)	9.28 (7.86–11.2)	10.7 (8.91–13.2)	12.3 (9.93–15.4)	13.9 (10.9–17.9)	16.1 (12.2–21.7)	17.8 (13.0–24.9)
20-day	3.90 (3.45–4.50)	5.43 (4.80–6.26)	7.47 (6.59–8.65)	9.18 (8.03–10.7)	11.6 (9.78–13.9)	13.4 (11.1–16.5)	15.4 (12.5–19.4)	17.5 (13.8–22.6)	20.4 (15.4–27.5)	22.8 (16.7–31.8)
30-day	4.62 (4.09–5.32)	6.43 (5.69–7.42)	8.87 (7.82–10.3)	10.9 (9.55–12.7)	13.8 (11.7–16.6)	16.1 (13.3–19.8)	18.5 (15.0–23.3)	21.0 (16.6–27.2)	24.7 (18.7–33.3)	27.6 (20.2–38.5)
45-day	5.52 (4.89–6.36)	7.63 (6.75–8.81)	10.5 (9.25–12.1)	12.9 (11.3–15.0)	16.3 (13.8–19.6)	19.0 (15.8–23.4)	21.9 (17.7–27.6)	25.0 (19.7–32.4)	29.4 (22.3–39.7)	33.1 (24.2–46.1)
60-day	6.45 (5.71–7.44)	8.83 (7.81–10.2)	12.1 (10.6–14.0)	14.8 (12.9–17.3)	18.7 (15.8–22.5)	21.8 (18.1–26.8)	25.1 (20.4–31.7)	28.7 (22.6–37.2)	33.9 (25.7–45.7)	38.2 (27.9–53.2)

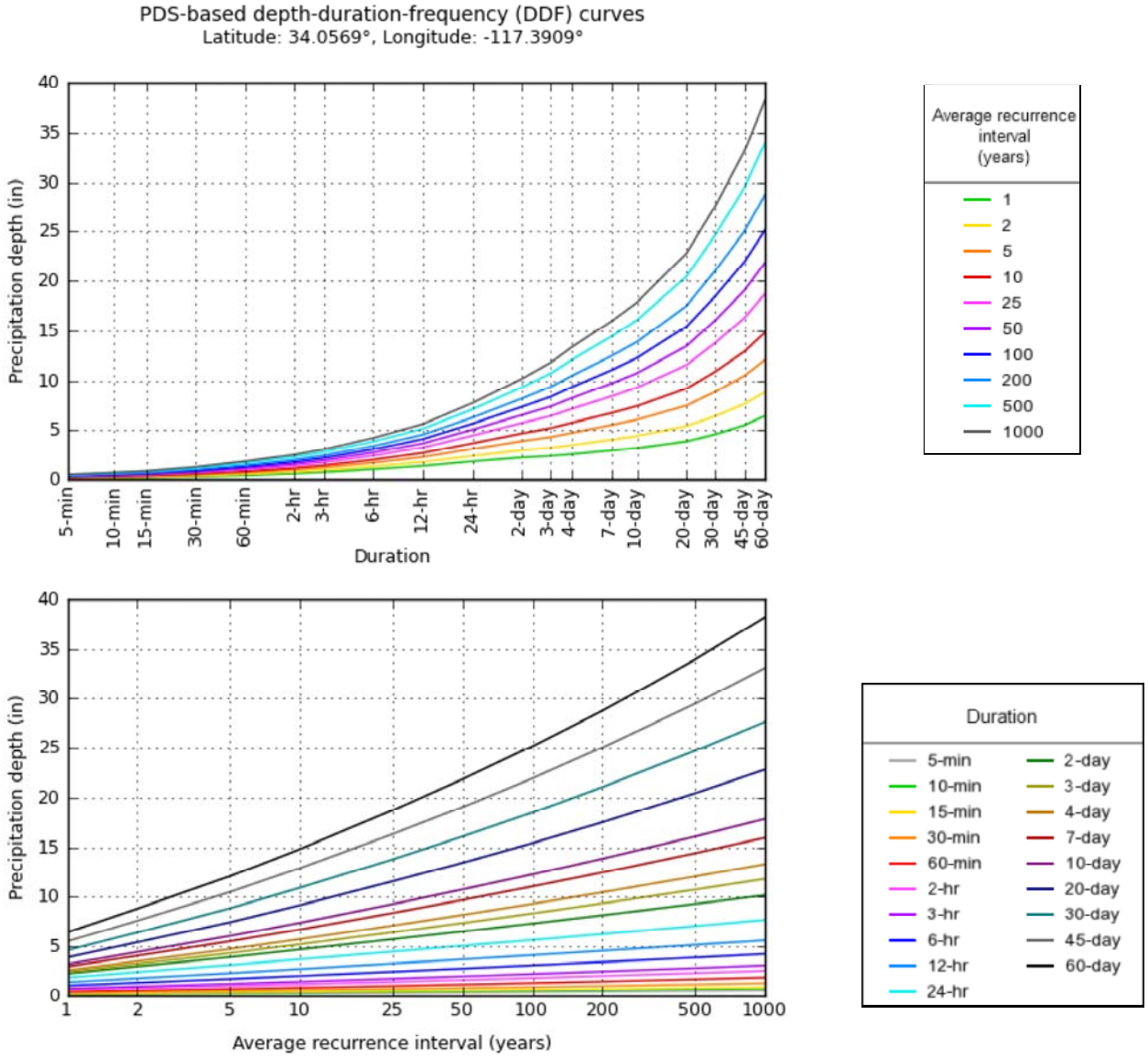
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

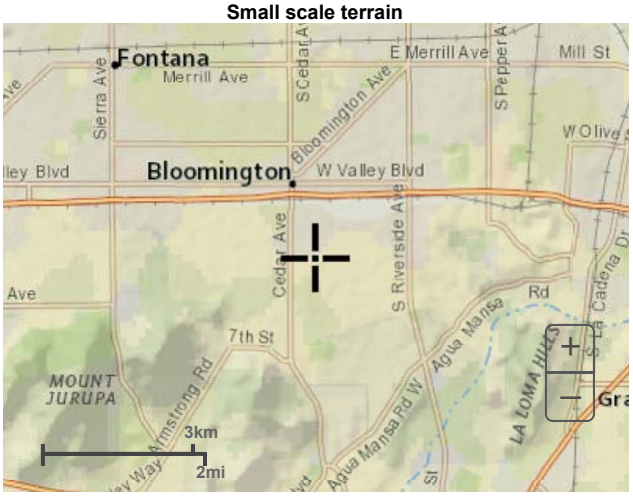


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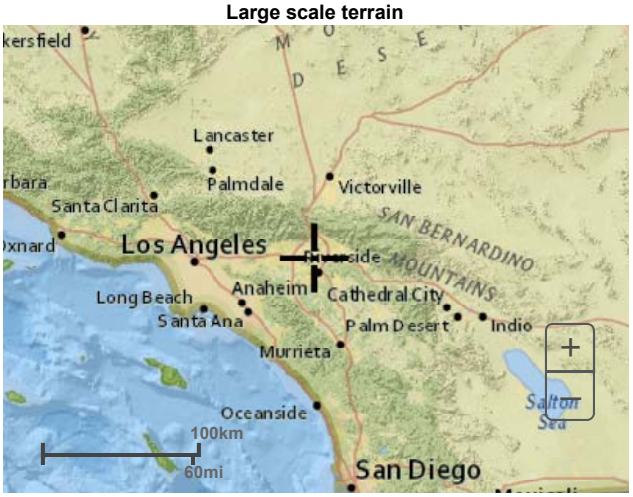
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Maps & aerials

Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



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