CITY OF FONTANA

SOUTH FONTANA MASTER DRAINAGE PLAN

MASTER PLAN DRAINAGE STUDY

FOR

EMPIRE CENTER AREA

FACILITIES:

P1, P2, P3, DZ-1, DZ-2, DZ-2A, DZ-3, DZ-4, DZ-5, DZ-6, & DZ-7

VOLUME NO. 2

PREPARED FOR: THE CITY OF FONTANA

STEVEN NAWAR, P.E. – PROJECT MANAGER

PREPARED BY: HALL & FOREMAN, INC.

43513 RIDGE PARK DRIVE
TEMECULA, CA 92590
(951) 676-6726

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JANUARY 2005
JN 04339

APPROVED
SN 3/22/05

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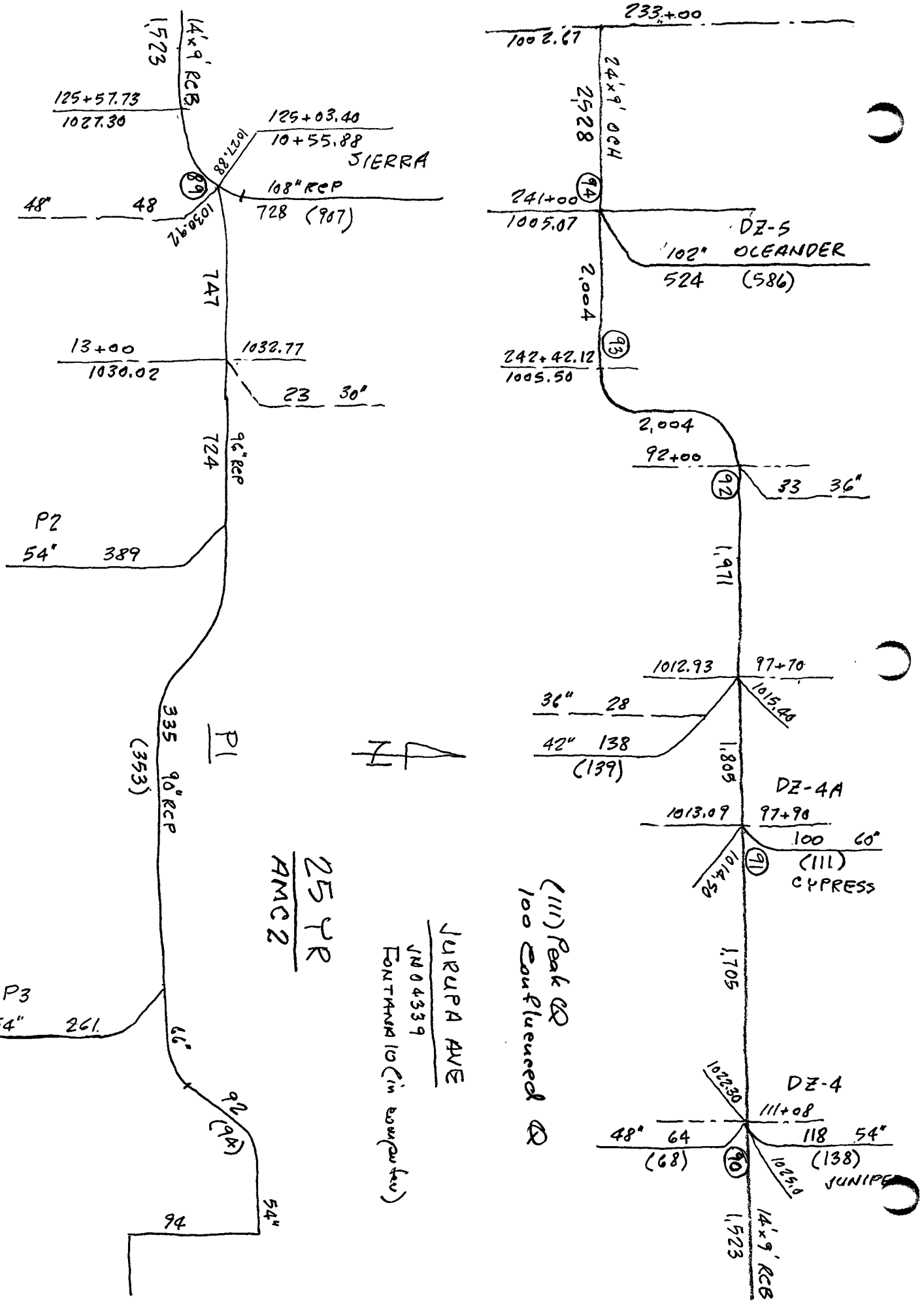
Q_{25} SUMMARIES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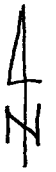
125+03.40
10+55.88
SIERRA
89
88'
1027.88
108" RCP
728 (907)
48"
48
1030.92
747
13+00
1030.02
1032.77
23 30"
724
96" RCP
P2
54" 389
P1
335
(353)
90" RCP
P3
54" 261
66"
92
(94)
54"
94
25 YR
AMC 2
JURUPA AVE
JN 04339
FONTANA 10 (in emp fw)
(111) Peak Q
100 Confluenced Q
233+00
1002.67
24'x9' OCH
2,528
94
241+00
1005.07
DZ-5
102" OCEANDER
524 (586)
2,004
93
242+42.12
1005.50
2,004
92+00
92
33 36"
1,971
1012.93
97+70
1015.44
36" 28
42" 138
(139)
1,805
DZ-4A
1013.09
97+90
100 60"
(111)
CYPRESS
91
1014.50
1,705
1022.30
DZ-4
111+08
48" 64
(68)
118 54"
(138)
90
1025.0
JUNIPER
14'x9' RCB
1,523

JN04337
1552

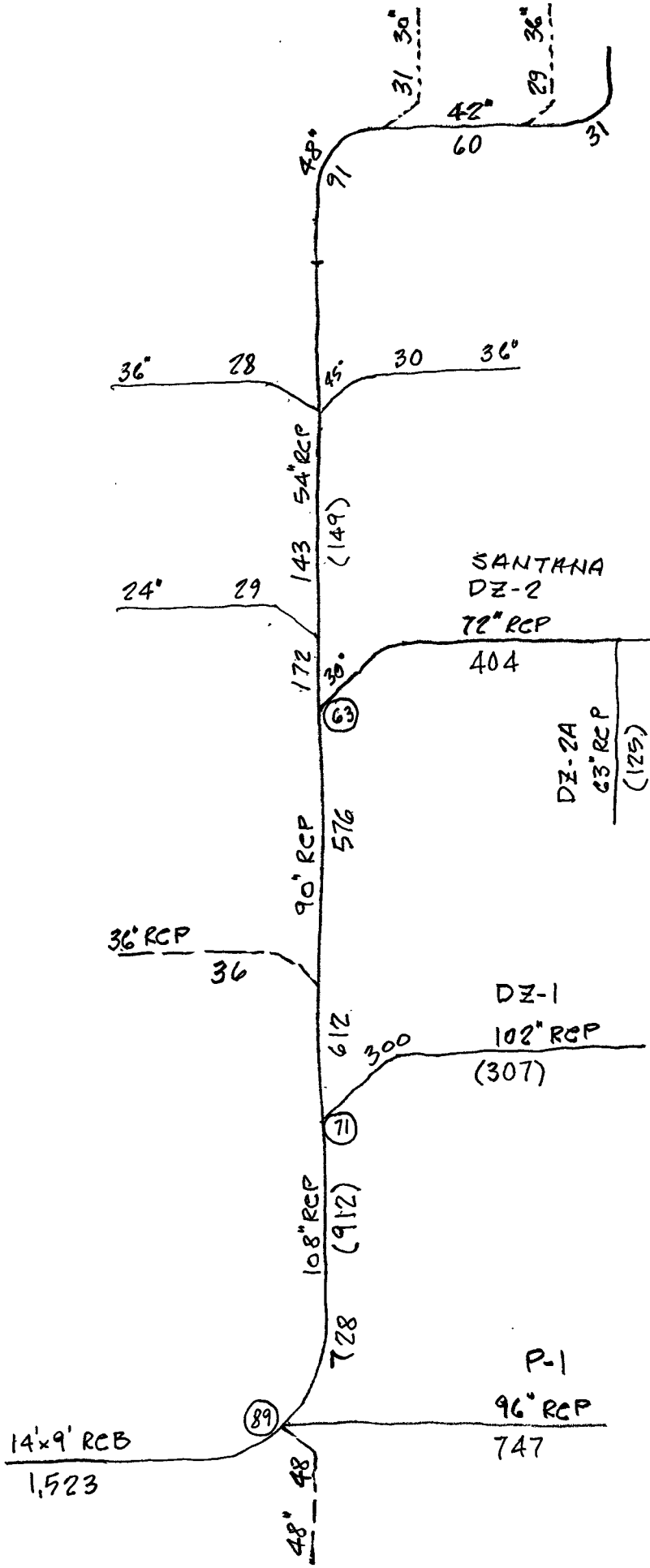
SIERRA AVE. W/O DETENTION

FONTANA7 (in computer)

25 YR.
AMC 2



(307) Peak Q
300 Confluenced Q



◆ LAND PLANNING ◆ CIVIL ENGINEERING ◆ SURVEYING

FONTANA

JOB No. 04339
BY HERMAN
DATE 8/2/04
SHT. 149
OF

25 YEAR

W/AMC2

LINE "DZ-2A"

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
Rational Hydrology Study Date: 01/13/05

FONTANA / LINE DZ-2A HYDROLOGY
25 YEAR STORM
JN 04339

Hall & Forman, Inc. - S/N 950

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

Rational hydrology study storm event year is 25.0
10 Year storm 1 hour rainfall = 0.930(In.)
100 Year storm 1 hour rainfall = 1.350(In.)
Computed rainfall intensity:
Storm year = 25.00 1 hour rainfall = 1.097 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

++
Process from Point/Station 112.000 to Point/Station 113.000
**** INITIAL AREA EVALUATION ****

SCHOOL subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 56.00
Pervious ratio(Ap) = 0.6000 Max loss rate(Fm)= 0.440(In/Hr)
Initial subarea data:
Initial area flow distance = 800.000(Ft.)
Top (of initial area) elevation = 1085.300(Ft.)
Bottom (of initial area) elevation = 1080.300(Ft.)
Difference in elevation = 5.000(Ft.)
Slope = 0.00625 s(%)= 0.63
TC = k(0.412)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 16.480 min.
Rainfall intensity = 2.382(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.734
Subarea runoff = 9.612(CFS)
Total initial stream area = 5.500(Ac.)
Pervious area fraction = 0.600
Initial area Fm value = 0.440(In/Hr)

++
Process from Point/Station 113.000 to Point/Station 116.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1080.300(Ft.)
End of street segment elevation = 1076.600(Ft.)
Length of street segment = 730.000(Ft.)

```
Height of curb above gutter flowline  =    8.0(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 =     19.224(CFS)
Depth of flow =   0.492(Ft.), Average velocity =   2.391(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  19.873(Ft.)
Flow velocity =   2.39(Ft/s)
Travel time =    5.09 min.     TC =   21.57  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Rainfall intensity =      2.027(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.813
Subarea runoff =     17.582(CFS) for   11.000(Ac.)
Total runoff =     27.194(CFS)
Effective area this stream =       16.50(Ac.)
Total Study Area (Main Stream No. 1) =       16.50(Ac.)
Area averaged Fm value =    0.196(In/Hr)
Street flow at end of street =     27.194(CFS)
Half street flow at end of street =     13.597(CFS)
Depth of flow =   0.540(Ft.), Average velocity =   2.737(Ft/s)
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      116.000 to Point/Station      116.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     16.500(Ac.)
Runoff from this stream =     27.194(CFS)
Time of concentration =   21.57 min.
Rainfall intensity =     2.027(In/Hr)
Area averaged loss rate (Fm) =    0.1957(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2667


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Process from Point/Station      114.000 to Point/Station      115.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
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Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1093.600(Ft.)
Bottom (of initial area) elevation =  1084.400(Ft.)
Difference in elevation =     9.200(Ft.)
Slope =    0.00920  s(%)=       0.92
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.306 min.
Rainfall intensity =      2.838(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.877
Subarea runoff =     13.687(CFS)
Total initial stream area =        5.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.073(In/Hr)


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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 =  1084.400(Ft.)
End of street segment elevation =  1076.600(Ft.)
Length of street segment  =   600.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     22.397(CFS)
Depth of flow =   0.447(Ft.), Average velocity =   3.539(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  17.587(Ft.)
Flow velocity =   3.54(Ft/s)
Travel time =    2.83 min.     TC =   15.13  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Rainfall intensity =      2.507(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.874
Subarea runoff =     13.695(CFS) for    7.000(Ac.)
Total runoff =     27.382(CFS)
Effective area this stream =       12.50(Ac.)
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Total Study Area (Main Stream No. 1) =       29.00(Ac.)
Area averaged Fm value =    0.073(In/Hr)
Street flow at end of street =     27.382(CFS)
Half street flow at end of street =     13.691(CFS)
Depth of flow =   0.475(Ft.), Average velocity =   3.719(Ft/s)
Flow width (from curb towards crown)=  19.000(Ft.)


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Process from Point/Station      116.000 to Point/Station      116.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     12.500(Ac.)
Runoff from this stream =     27.382(CFS)
Time of concentration =   15.13 min.
Rainfall intensity =     2.507(In/Hr)
Area averaged loss rate (Fm) =    0.0734(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

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


1        27.194      21.57                2.027
2        27.382      15.13                2.507
Qmax(1) =
          1.000 *     1.000 *    27.194) +
          0.803 *     1.000 *    27.382) + =      49.172
Qmax(2) =
          1.262 *     0.702 *    27.194) +
          1.000 *     1.000 *    27.382) + =      51.465

Total of 2 streams to confluence:
Flow rates before confluence point:
      27.194      27.382
Maximum flow rates at confluence using above data:
      49.172      51.465
Area of streams before confluence:
      16.500      12.500
Effective area values after confluence:
      29.000      24.075
Results of confluence:
Total flow rate =     51.465(CFS)
Time of concentration =    15.132 min.
Effective stream area after confluence =     24.075(Ac.)
Stream Area average Pervious fraction(Ap) =  0.195
Stream Area average soil loss rate(Fm) =    0.143(In/Hr)
Study area (this main stream) =      29.00(Ac.)


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Process from Point/Station      116.000 to Point/Station       52.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1069.600(Ft.)
Downstream point/station elevation =  1061.900(Ft.)
Pipe length =   650.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    51.465(CFS)
Given pipe size =     39.00(In.)
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Calculated individual pipe flow  =    51.465(CFS)
Normal flow depth in pipe =   21.16(In.)
Flow top width inside pipe =   38.86(In.)
Critical Depth =   27.48(In.)
Pipe flow velocity =     11.20(Ft/s)
Travel time through pipe =    0.97 min.
Time of concentration (TC) =    16.10 min.


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Process from Point/Station      52.000 to Point/Station       52.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     24.075(Ac.)
Runoff from this stream =     51.465(CFS)
Time of concentration =   16.10 min.
Rainfall intensity =     2.416(In/Hr)
Area averaged loss rate (Fm) =    0.1430(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1948


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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 = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1076.000(Ft.)
Bottom (of initial area) elevation =  1071.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.902 min.
Rainfall intensity =      2.638(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.875
Subarea runoff =     11.541(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.073(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 =  1071.000(Ft.)
End of street segment elevation =  1068.900(Ft.)
Length of street segment  =   420.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     23.083(CFS)
Depth of flow =   0.517(Ft.), Average velocity =   2.554(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 =   2.55(Ft/s)
Travel time =    2.74 min.     TC =   16.64  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Rainfall intensity =      2.368(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.872
Subarea runoff =     19.438(CFS) for   10.000(Ac.)
Total runoff =     30.980(CFS)
Effective area this stream =       15.00(Ac.)
Total Study Area (Main Stream No. 1) =       44.00(Ac.)
Area averaged Fm value =    0.073(In/Hr)
Street flow at end of street =     30.980(CFS)
Half street flow at end of street =     15.490(CFS)
Depth of flow =   0.561(Ft.), Average velocity =   2.871(Ft/s)
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      119.000 to Point/Station      119.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     15.000(Ac.)
Runoff from this stream =     30.980(CFS)
Time of concentration =   16.64 min.
Rainfall intensity =     2.368(In/Hr)
Area averaged loss rate (Fm) =    0.0734(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

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


1       51.465     16.10                2.416
2       30.980     16.64                2.368
Qmax(1) =
          1.000 *    1.000 *    51.465) +
          1.021 *    0.967 *    30.980) + =      82.054
Qmax(2) =
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          0.979 *    1.000 *    51.465) +
          1.000 *    1.000 *    30.980) + =      81.364

Total of 2 streams to confluence:
Flow rates before confluence point:
      51.465      30.980
Maximum flow rates at confluence using above data:
       82.054       81.364
Area of streams before confluence:
       24.075       15.000
Effective area values after confluence:
       38.585       39.075
Results of confluence:
Total flow rate =     82.054(CFS)
Time of concentration =    16.099 min.
Effective stream area after confluence =     38.585(Ac.)
Stream Area average Pervious fraction(Ap) =  0.158
Stream Area average soil loss rate(Fm) =    0.116(In/Hr)
Study area (this main stream) =      39.08(Ac.)


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Process from Point/Station       52.000 to Point/Station       53.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1061.900(Ft.)
Downstream point/station elevation =  1059.400(Ft.)
Pipe length  =   500.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    82.054(CFS)
Given pipe size =     42.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     2.519(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      3.325(Ft.)
 Minor friction loss =      1.694(Ft.)    K-factor =   1.50
Pipe flow velocity =      8.53(Ft/s)
Travel time through pipe =    0.98 min.
Time of concentration (TC) =    17.08 min.


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Process from Point/Station       53.000 to Point/Station       53.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     38.585(Ac.)
Runoff from this stream =     82.054(CFS)
Time of concentration =   17.08 min.
Rainfall intensity =     2.332(In/Hr)
Area averaged loss rate (Fm) =    0.1163(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1584


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Process from Point/Station      120.000 to Point/Station      121.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
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Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1072.000(Ft.)
Bottom (of initial area) elevation =  1067.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.902 min.
Rainfall intensity =      2.638(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.875
Subarea runoff =     12.696(CFS)
Total initial stream area =        5.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.073(In/Hr)


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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 =  1067.000(Ft.)
End of street segment elevation =  1064.700(Ft.)
Length of street segment  =   450.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     23.083(CFS)
Depth of flow =   0.516(Ft.), Average velocity =   2.571(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 =   2.57(Ft/s)
Travel time =    2.92 min.     TC =   16.82  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Rainfall intensity =      2.353(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.872
Subarea runoff =     17.056(CFS) for    9.000(Ac.)
Total runoff =     29.752(CFS)
Effective area this stream =       14.50(Ac.)
Total Study Area (Main Stream No. 1) =       58.50(Ac.)
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Area averaged Fm value =    0.073(In/Hr)
Street flow at end of street =    29.752(CFS)
Half street flow at end of street =    14.876(CFS)
Depth of flow =   0.553(Ft.), Average velocity =   2.844(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      122.000 to Point/Station      122.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     14.500(Ac.)
Runoff from this stream =     29.752(CFS)
Time of concentration =   16.82 min.
Rainfall intensity =     2.353(In/Hr)
Area averaged loss rate (Fm) =    0.0734(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

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


1        82.054     17.08                2.332
2        29.752     16.82                2.353
Qmax(1) =
          1.000 *    1.000 *    82.054) +
          0.991 *    1.000 *    29.752) + =     111.529
Qmax(2) =
          1.010 *    0.985 *    82.054) +
          1.000 *    1.000 *    29.752) + =     111.350

Total of 2 streams to confluence:
Flow rates before confluence point:
      82.054      29.752
Maximum flow rates at confluence using above data:
     111.529      111.350
Area of streams before confluence:
       38.585       14.500
Effective area values after confluence:
       53.085       52.505
Results of confluence:
Total flow rate =    111.529(CFS)
Time of concentration =    17.076 min.
Effective stream area after confluence =     53.085(Ac.)
Stream Area average Pervious fraction(Ap) =  0.142
Stream Area average soil loss rate(Fm) =    0.105(In/Hr)
Study area (this main stream) =      53.08(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       53.000 to Point/Station       54.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1052.500(Ft.)
Downstream point/station elevation =  1048.200(Ft.)
Pipe length =   860.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow =   111.529(CFS)
Given pipe size =     60.00(In.)
```

```
Calculated individual pipe flow  =   111.529(CFS)
Normal flow depth in pipe =   33.70(In.)
Flow top width inside pipe =   59.54(In.)
Critical Depth =   36.14(In.)
Pipe flow velocity =      9.83(Ft/s)
Travel time through pipe =    1.46 min.
Time of concentration (TC) =    18.53 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       54.000 to Point/Station       54.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     53.085(Ac.)
Runoff from this stream =    111.529(CFS)
Time of concentration =   18.53 min.
Rainfall intensity =     2.220(In/Hr)
Area averaged loss rate (Fm) =    0.1046(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1425


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      123.000 to Point/Station      124.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1064.700(Ft.)
Bottom (of initial area) elevation =  1059.700(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.902 min.
Rainfall intensity =      2.638(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.875
Subarea runoff =     16.158(CFS)
Total initial stream area =        7.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.073(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      124.000 to Point/Station      124.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      7.000(Ac.)
Runoff from this stream =     16.158(CFS)
Time of concentration =   13.90 min.
Rainfall intensity =     2.638(In/Hr)
Area averaged loss rate (Fm) =    0.0734(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:
```

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

1       111.529      18.53                2.220
2        16.158      13.90                2.638
Qmax(1) =
          1.000 *     1.000 *   111.529) +
          0.837 *     1.000 *    16.158) + =      125.052
Qmax(2) =
          1.198 *     0.750 *   111.529) +
          1.000 *     1.000 *    16.158) + =      116.346

Total of 2 streams to confluence:
Flow rates before confluence point:
     111.529      16.158
Maximum flow rates at confluence using above data:
      125.052      116.346
Area of streams before confluence:
       53.085        7.000
Effective area values after confluence:
       60.085       46.817
Results of confluence:
Total flow rate =    125.052(CFS)
Time of concentration =    18.535 min.
Effective stream area after confluence =     60.085(Ac.)
Stream Area average Pervious fraction(Ap) =  0.138
Stream Area average soil loss rate(Fm) =    0.101(In/Hr)
Study area (this main stream) =      60.08(Ac.)


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Process from Point/Station       54.000 to Point/Station       55.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1048.200(Ft.)
Downstream point/station elevation =  1046.500(Ft.)
Pipe length  =   340.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   125.052(CFS)
Given pipe size =     63.00(In.)
Calculated individual pipe flow  =   125.052(CFS)
Normal flow depth in pipe =   35.02(In.)
Flow top width inside pipe =   62.61(In.)
Critical Depth =   37.85(In.)
Pipe flow velocity =     10.11(Ft/s)
Travel time through pipe =    0.56 min.
Time of concentration (TC) =    19.10 min.
End of computations, Total Study Area =           65.50 (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) = 0.142
Area averaged SCS curve number =  56.0
```

LINE "DZ-2"

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
Rational Hydrology Study Date: 01/13/05

FONTANA / LINE DZ-2 HYDROLOGY
25 YEAR STORM
JN 04339

Hall & Forman, Inc. - S/N 950

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

Rational hydrology study storm event year is 25.0
10 Year storm 1 hour rainfall = 0.930(In.)
100 Year storm 1 hour rainfall = 1.350(In.)
Computed rainfall intensity:
Storm year = 25.00 1 hour rainfall = 1.097 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

++
Process from Point/Station 100.000 to Point/Station 101.000
**** INITIAL AREA EVALUATION ****

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 = 960.000(Ft.)
Top (of initial area) elevation = 1103.000(Ft.)
Bottom (of initial area) elevation = 1098.400(Ft.)
Difference in elevation = 4.600(Ft.)
Slope = 0.00479 s(%)= 0.48
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 13.794 min.
Rainfall intensity = 2.651(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.867
Subarea runoff = 11.488(CFS)
Total initial stream area = 5.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.098(In/Hr)

++
Process from Point/Station 101.000 to Point/Station 102.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1098.400(Ft.)
End of street segment elevation = 1093.600(Ft.)
Length of street segment = 590.000(Ft.)

```
Height of curb above gutter flowline  =    8.0(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 =     17.231(CFS)
Depth of flow =   0.443(Ft.), Average velocity =   2.781(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  17.399(Ft.)
Flow velocity =   2.78(Ft/s)
Travel time =    3.54 min.     TC =   17.33  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Rainfall intensity =      2.311(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.867
Subarea runoff =      8.544(CFS) for    5.000(Ac.)
Total runoff =     20.032(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =       10.00(Ac.)
Area averaged Fm value =    0.086(In/Hr)
Street flow at end of street =     20.032(CFS)
Half street flow at end of street =     10.016(CFS)
Depth of flow =   0.464(Ft.), Average velocity =   2.886(Ft/s)
Flow width (from curb towards crown)=  18.438(Ft.)


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Process from Point/Station      102.000 to Point/Station       50.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1085.300(Ft.)
Downstream point/station elevation =  1079.500(Ft.)
Pipe length  =   460.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    20.032(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =    20.032(CFS)
Normal flow depth in pipe =   16.08(In.)
Flow top width inside pipe =   22.57(In.)
Critical Depth =   19.29(In.)
Pipe flow velocity =      8.96(Ft/s)
Travel time through pipe =    0.86 min.
Time of concentration (TC) =    18.19 min.


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Process from Point/Station       50.000 to Point/Station       50.000
```

```
**** CONFLUENCE OF MINOR STREAMS ****
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      10.000(Ac.)
Runoff from this stream =      20.032(CFS)
Time of concentration =   18.19 min.
Rainfall intensity =      2.245(In/Hr)
Area averaged loss rate (Fm) =     0.0856(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** 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 =  1000.000(Ft.)
Top (of initial area) elevation =  1103.000(Ft.)
Bottom (of initial area) elevation =  1098.400(Ft.)
Difference in elevation =      4.600(Ft.)
Slope =    0.00460  s(%)=       0.46
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.136 min.
Rainfall intensity =      2.612(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.866
Subarea runoff =     12.445(CFS)
Total initial stream area =        5.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      105.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
Top of street segment elevation =  1098.400(Ft.)
End of street segment elevation =  1092.200(Ft.)
Length of street segment  =   700.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     23.193(CFS)
Depth of flow =   0.479(Ft.), Average velocity =   3.090(Ft/s)
Streetflow hydraulics at midpoint of street travel:
```

```
Halfstreet flow width =  19.189(Ft.)
Flow velocity =   3.09(Ft/s)
Travel time =    3.78 min.     TC =   17.91  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 =      2.266(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.861
Subarea runoff =     16.826(CFS) for    9.500(Ac.)
Total runoff =     29.271(CFS)
Effective area this stream =       15.00(Ac.)
Total Study Area (Main Stream No. 1) =       25.00(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Street flow at end of street =     29.271(CFS)
Half street flow at end of street =     14.636(CFS)
Depth of flow =   0.511(Ft.), Average velocity =   3.335(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station       50.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1083.800(Ft.)
Downstream point/station elevation =  1079.500(Ft.)
Pipe length  =   570.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    29.271(CFS)
Given pipe size =     30.00(In.)
Calculated individual pipe flow  =    29.271(CFS)
Normal flow depth in pipe =   20.70(In.)
Flow top width inside pipe =   27.75(In.)
Critical Depth =   22.15(In.)
Pipe flow velocity =      8.10(Ft/s)
Travel time through pipe =    1.17 min.
Time of concentration (TC) =    19.08 min.


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Process from Point/Station       50.000 to Point/Station       50.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     15.000(Ac.)
Runoff from this stream =     29.271(CFS)
Time of concentration =   19.08 min.
Rainfall intensity =     2.181(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       TC              Rainfall Intensity
  No.        (CFS)       (min)                   (In/Hr)
```

```
1       20.032     18.19                2.245
2       29.271     19.08                2.181
Qmax(1) =
          1.000 *    1.000 *    20.032) +
          1.031 *    0.953 *    29.271) + =      48.782
Qmax(2) =
          0.970 *    1.000 *    20.032) +
          1.000 *    1.000 *    29.271) + =      48.709

Total of 2 streams to confluence:
Flow rates before confluence point:
      20.032      29.271
Maximum flow rates at confluence using above data:
       48.782       48.709
Area of streams before confluence:
       10.000       15.000
Effective area values after confluence:
       24.293       25.000
Results of confluence:
Total flow rate =     48.782(CFS)
Time of concentration =    18.186 min.
Effective stream area after confluence =     24.293(Ac.)
Stream Area average Pervious fraction(Ap) =  0.100
Stream Area average soil loss rate(Fm) =    0.093(In/Hr)
Study area (this main stream) =      25.00(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       50.000 to Point/Station       51.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1079.500(Ft.)
Downstream point/station elevation =  1071.300(Ft.)
Pipe length  =  1320.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    48.782(CFS)
Given pipe size =     39.00(In.)
Calculated individual pipe flow  =    48.782(CFS)
Normal flow depth in pipe =   25.20(In.)
Flow top width inside pipe =   37.30(In.)
Critical Depth =   26.75(In.)
Pipe flow velocity =      8.61(Ft/s)
Travel time through pipe =    2.56 min.
Time of concentration (TC) =    20.74 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       51.000 to Point/Station       51.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     24.293(Ac.)
Runoff from this stream =     48.782(CFS)
Time of concentration =   20.74 min.
Rainfall intensity =     2.075(In/Hr)
Area averaged loss rate (Fm) =    0.0929(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


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Process from Point/Station      106.000 to Point/Station      107.000
**** INITIAL AREA EVALUATION ****
```

```
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1093.600(Ft.)
Bottom (of initial area) elevation =  1085.400(Ft.)
Difference in elevation =     8.200(Ft.)
Slope =    0.00820  s(%)=       0.82
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.592 min.
Rainfall intensity =      2.800(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.876
Subarea runoff =     13.494(CFS)
Total initial stream area =        5.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.073(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      108.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1085.400(Ft.)
End of street segment elevation =  1078.300(Ft.)
Length of street segment  =   700.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     20.855(CFS)
Depth of flow =   0.454(Ft.), Average velocity =   3.167(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  17.948(Ft.)
Flow velocity =   3.17(Ft/s)
Travel time =    3.68 min.     TC =   16.28  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Rainfall intensity =      2.400(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.872
```

```
Subarea runoff =     10.586(CFS) for    6.000(Ac.)
Total runoff =     24.081(CFS)
Effective area this stream =       11.50(Ac.)
Total Study Area (Main Stream No. 1) =       36.50(Ac.)
Area averaged Fm value =    0.073(In/Hr)
Street flow at end of street =     24.081(CFS)
Half street flow at end of street =     12.040(CFS)
Depth of flow =   0.474(Ft.), Average velocity =   3.282(Ft/s)
Flow width (from curb towards crown)=  18.968(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      108.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     11.500(Ac.)
Runoff from this stream =     24.081(CFS)
Time of concentration =   16.28 min.
Rainfall intensity =     2.400(In/Hr)
Area averaged loss rate (Fm) =    0.0734(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

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


1        48.782      20.74                2.075
2        24.081      16.28                2.400
Qmax(1) =
          1.000 *     1.000 *    48.782) +
          0.860 *     1.000 *    24.081) + =      69.500
Qmax(2) =
          1.164 *     0.785 *    48.782) +
          1.000 *     1.000 *    24.081) + =      68.635

Total of 2 streams to confluence:
Flow rates before confluence point:
      48.782      24.081
Maximum flow rates at confluence using above data:
      69.500      68.635
Area of streams before confluence:
      24.293      11.500
Effective area values after confluence:
      35.793      30.564
Results of confluence:
Total flow rate =     69.500(CFS)
Time of concentration =    20.741 min.
Effective stream area after confluence =     35.793(Ac.)
Stream Area average Pervious fraction(Ap) =  0.100
Stream Area average soil loss rate(Fm) =    0.087(In/Hr)
Study area (this main stream) =      35.79(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       51.000 to Point/Station       55.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1071.300(Ft.)
Downstream point/station elevation =  1062.400(Ft.)
```

```
Pipe length  =   900.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    69.500(CFS)
Given pipe size =     42.00(In.)
Calculated individual pipe flow  =    69.500(CFS)
Normal flow depth in pipe =   25.76(In.)
Flow top width inside pipe =   40.91(In.)
Critical Depth =   31.34(In.)
Pipe flow velocity =     11.23(Ft/s)
Travel time through pipe =    1.34 min.
Time of concentration (TC) =    22.08 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       55.000 to Point/Station       55.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     35.793(Ac.)
Runoff from this stream =     69.500(CFS)
Time of concentration =   22.08 min.
Rainfall intensity =     1.999(In/Hr)
Area averaged loss rate (Fm) =    0.0866(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      110.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1080.000(Ft.)
Bottom (of initial area) elevation =  1073.700(Ft.)
Difference in elevation =     6.300(Ft.)
Slope =    0.00630  s(%)=       0.63
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.274 min.
Rainfall intensity =      2.712(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.876
Subarea runoff =     10.688(CFS)
Total initial stream area =        4.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.073(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      111.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1073.700(Ft.)
End of street segment elevation =  1069.400(Ft.)
Length of street segment  =   350.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     15.438(CFS)
Depth of flow =   0.403(Ft.), Average velocity =   3.161(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  15.396(Ft.)
Flow velocity =   3.16(Ft/s)
Travel time =    1.85 min.     TC =   15.12  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Rainfall intensity =     2.509(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.874
Subarea runoff =      7.941(CFS) for    4.000(Ac.)
Total runoff =     18.629(CFS)
Effective area this stream =       8.50(Ac.)
Total Study Area (Main Stream No. 1) =       45.00(Ac.)
Area averaged Fm value =    0.073(In/Hr)
Street flow at end of street =     18.629(CFS)
Half street flow at end of street =      9.315(CFS)
Depth of flow =   0.426(Ft.), Average velocity =   3.311(Ft/s)
Flow width (from curb towards crown)=  16.560(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      111.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      8.500(Ac.)
Runoff from this stream =     18.629(CFS)
Time of concentration =   15.12 min.
Rainfall intensity =     2.509(In/Hr)
Area averaged loss rate (Fm) =    0.0734(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


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Process from Point/Station      125.000 to Point/Station      126.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
```

```
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1093.200(Ft.)
Bottom (of initial area) elevation =  1085.300(Ft.)
Difference in elevation =     7.900(Ft.)
Slope =    0.00790  s(%)=       0.79
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.687 min.
Rainfall intensity =      2.787(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.876
Subarea runoff =     13.433(CFS)
Total initial stream area =        5.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.073(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 =  1085.300(Ft.)
End of street segment elevation =  1076.300(Ft.)
Length of street segment  =   900.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     28.086(CFS)
Depth of flow =   0.498(Ft.), Average velocity =   3.402(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 =   3.40(Ft/s)
Travel time =    4.41 min.     TC =   17.10  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Rainfall intensity =      2.330(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.872
Subarea runoff =     22.115(CFS) for   12.000(Ac.)
Total runoff =     35.547(CFS)
Effective area this stream =       17.50(Ac.)
Total Study Area (Main Stream No. 1) =       62.50(Ac.)
Area averaged Fm value =    0.073(In/Hr)
```

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Street flow at end of street =     35.547(CFS)
Half street flow at end of street =     17.774(CFS)
Depth of flow =   0.529(Ft.), Average velocity =   3.736(Ft/s)
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      127.000 to Point/Station       55.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1069.300(Ft.)
Downstream point/station elevation =  1046.500(Ft.)
Pipe length  =  1000.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    35.547(CFS)
Given pipe size =     30.00(In.)
Calculated individual pipe flow  =    35.547(CFS)
Normal flow depth in pipe =   16.29(In.)
Flow top width inside pipe =   29.89(In.)
Critical Depth =   24.28(In.)
Pipe flow velocity =     13.05(Ft/s)
Travel time through pipe =    1.28 min.
Time of concentration (TC) =    18.37 min.


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Process from Point/Station       55.000 to Point/Station       55.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =     17.500(Ac.)
Runoff from this stream =     35.547(CFS)
Time of concentration =   18.37 min.
Rainfall intensity =     2.232(In/Hr)
Area averaged loss rate (Fm) =    0.0734(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


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Process from Point/Station      128.000 to Point/Station      129.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1078.300(Ft.)
Bottom (of initial area) elevation =  1069.400(Ft.)
Difference in elevation =     8.900(Ft.)
Slope =    0.00890  s(%)=       0.89
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.388 min.
Rainfall intensity =      2.827(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.877
Subarea runoff =     22.306(CFS)
Total initial stream area =        9.000(Ac.)
```

```
Pervious area fraction = 0.100
Initial area Fm value =    0.073(In/Hr)

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Process from Point/Station      129.000 to Point/Station      129.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 4
Stream flow area =      9.000(Ac.)
Runoff from this stream =     22.306(CFS)
Time of concentration =   12.39 min.
Rainfall intensity =     2.827(In/Hr)
Area averaged loss rate (Fm) =    0.0734(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000

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Process from Point/Station       55.000 to Point/Station       55.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 56.16
Pervious ratio(Ap) = 0.1380     Max loss rate(Fm)=     0.101(In/Hr)
Rainfall intensity =      2.220(In/Hr) for a    25.0 year storm
User specified values are as follows:
TC =  18.54 min.  Rain intensity =       2.22(In/Hr)
Total area this stream =        60.09(Ac.)
Total Study Area (Main Stream No. 1) =      131.59(Ac.)
Total runoff =    125.05(CFS)

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Process from Point/Station       55.000 to Point/Station       55.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 5
Stream flow area =     60.090(Ac.)
Runoff from this stream =    125.050(CFS)
Time of concentration =   18.54 min.
Rainfall intensity =     2.220(In/Hr)
Area averaged loss rate (Fm) =    0.1010(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1380
Summary of stream data:

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


1        69.500      22.08                 1.999
2        18.629      15.12                 2.509
3        35.547      18.37                 2.232
4        22.306      12.39                 2.827
5       125.050      18.54                 2.220
Qmax(1) =
          1.000 *     1.000 *     69.500) +
          0.791 *     1.000 *     18.629) +
          0.892 *     1.000 *     35.547) +
          0.699 *     1.000 *     22.306) +
          0.896 *     1.000 *    125.050) + =     243.559
```

```
Qmax(2) =
        1.267 *    0.685 *    69.500) +
        1.000 *    1.000 *    18.629) +
        1.128 *    0.823 *    35.547) +
        0.884 *    1.000 *    22.306) +
        1.136 *    0.816 *   125.050) + =     247.530
Qmax(3) =
        1.122 *    0.832 *    69.500) +
        0.886 *    1.000 *    18.629) +
        1.000 *    1.000 *    35.547) +
        0.784 *    1.000 *    22.306) +
        1.006 *    0.991 *   125.050) + =     259.054
Qmax(4) =
        1.433 *    0.561 *    69.500) +
        1.131 *    0.819 *    18.629) +
        1.276 *    0.674 *    35.547) +
        1.000 *    1.000 *    22.306) +
        1.287 *    0.668 *   125.050) + =     233.550
Qmax(5) =
        1.115 *    0.840 *    69.500) +
        0.881 *    1.000 *    18.629) +
        0.994 *    1.000 *    35.547) +
        0.779 *    1.000 *    22.306) +
        1.000 *    1.000 *   125.050) + =     259.305

Total of 5 streams to confluence:
Flow rates before confluence point:
     69.500      18.629      35.547      22.306     125.050
Maximum flow rates at confluence using above data:
     243.559     247.530     259.054     233.550     259.305
Area of streams before confluence:
      35.793       8.500      17.500       9.000      60.090
Effective area values after confluence:
     130.883     105.418     124.336      87.999     125.149
Results of confluence:
Total flow rate =    259.305(CFS)
Time of concentration =    18.540 min.
Effective stream area after confluence =    125.149(Ac.)
Stream Area average Pervious fraction(Ap) =  0.117
Stream Area average soil loss rate(Fm) =    0.090(In/Hr)
Study area (this main stream) =     130.88(Ac.)


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Process from Point/Station       55.000 to Point/Station       56.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1046.500(Ft.)
Downstream point/station elevation =  1043.300(Ft.)
Pipe length  =  1000.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   259.305(CFS)
Given pipe size =     81.00(In.)
Calculated individual pipe flow  =   259.305(CFS)
Normal flow depth in pipe =   54.33(In.)
Flow top width inside pipe =   76.13(In.)
Critical Depth =   51.19(In.)
Pipe flow velocity =     10.16(Ft/s)
Travel time through pipe =    1.64 min.
Time of concentration (TC) =    20.18 min.
```

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Process from Point/Station       56.000 to Point/Station       56.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     125.149(Ac.)
Runoff from this stream =     259.305(CFS)
Time of concentration =   20.18 min.
Rainfall intensity =     2.110(In/Hr)
Area averaged loss rate (Fm) =     0.0897(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1174


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Process from Point/Station      130.000 to Point/Station      131.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1092.200(Ft.)
Bottom (of initial area) elevation =  1084.100(Ft.)
Difference in elevation =     8.100(Ft.)
Slope =    0.00810  s(%)=       0.81
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.623 min.
Rainfall intensity =      2.795(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.876
Subarea runoff =     13.474(CFS)
Total initial stream area =        5.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.073(In/Hr)


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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 =  1084.100(Ft.)
End of street segment elevation =  1075.000(Ft.)
Length of street segment  =   900.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     28.173(CFS)
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```
Depth of flow =   0.498(Ft.), Average velocity =   3.418(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 =   3.42(Ft/s)
Travel time =    4.39 min.     TC =   17.01  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Rainfall intensity =      2.337(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.872
Subarea runoff =     22.181(CFS) for   12.000(Ac.)
Total runoff =     35.655(CFS)
Effective area this stream =       17.50(Ac.)
Total Study Area (Main Stream No. 1) =      149.09(Ac.)
Area averaged Fm value =    0.073(In/Hr)
Street flow at end of street =     35.655(CFS)
Half street flow at end of street =     17.827(CFS)
Depth of flow =   0.529(Ft.), Average velocity =   3.753(Ft/s)
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      132.000 to Point/Station       56.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1068.000(Ft.)
Downstream point/station elevation =  1043.300(Ft.)
Pipe length  =  1100.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    35.655(CFS)
Given pipe size =     30.00(In.)
Calculated individual pipe flow  =    35.655(CFS)
Normal flow depth in pipe =   16.41(In.)
Flow top width inside pipe =   29.87(In.)
Critical Depth =   24.30(In.)
Pipe flow velocity =     12.99(Ft/s)
Travel time through pipe =    1.41 min.
Time of concentration (TC) =    18.42 min.


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Process from Point/Station      56.000 to Point/Station       56.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     17.500(Ac.)
Runoff from this stream =     35.655(CFS)
Time of concentration =   18.42 min.
Rainfall intensity =     2.228(In/Hr)
Area averaged loss rate (Fm) =    0.0734(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


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Process from Point/Station      133.000 to Point/Station      134.000
**** INITIAL AREA EVALUATION ****
-------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1076.300(Ft.)
Bottom (of initial area) elevation =  1070.900(Ft.)
Difference in elevation =     5.400(Ft.)
Slope =    0.00540  s(%)=       0.54
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.690 min.
Rainfall intensity =      2.663(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.875
Subarea runoff =     12.817(CFS)
Total initial stream area =        5.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.073(In/Hr)


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Process from Point/Station      134.000 to Point/Station      135.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
-------------------------------------------------------------------------
Top of street segment elevation =  1070.900(Ft.)
End of street segment elevation =  1064.100(Ft.)
Length of street segment  =   800.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     38.450(CFS)
Depth of flow =   0.553(Ft.), Average velocity =   3.670(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 =   3.67(Ft/s)
Travel time =    3.63 min.     TC =   17.32  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
```

Rainfall intensity = 2.312(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area,(total area with modified rational method)(Q=KCIA) is C = 0.871
Subarea runoff = 42.588(CFS) for 22.000(Ac.)
Total runoff = 55.405(CFS)
Effective area this stream = 27.50(Ac.)
Total Study Area (Main Stream No. 1) = 176.59(Ac.)
Area averaged Fm value = 0.073(In/Hr)
Street flow at end of street = 55.405(CFS)
Half street flow at end of street = 27.703(CFS)
Depth of flow = 0.618(Ft.), Average velocity = 4.242(Ft/s)
Note: depth of flow exceeds top of street crown.
Flow width (from curb towards crown)= 20.000(Ft.)

++
Process from Point/Station 135.000 to Point/Station 135.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 3
Stream flow area = 27.500(Ac.)
Runoff from this stream = 55.405(CFS)
Time of concentration = 17.32 min.
Rainfall intensity = 2.312(In/Hr)
Area averaged loss rate (Fm) = 0.0734(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	259.305	20.18	2.110
2	35.655	18.42	2.228
3	55.405	17.32	2.312

Qmax(1) =
1.000 * 1.000 * 259.305) +
0.945 * 1.000 * 35.655) +
0.910 * 1.000 * 55.405) + = 343.395

Qmax(2) =
1.059 * 0.913 * 259.305) +
1.000 * 1.000 * 35.655) +
0.962 * 1.000 * 55.405) + = 339.603

Qmax(3) =
1.100 * 0.858 * 259.305) +
1.039 * 0.940 * 35.655) +
1.000 * 1.000 * 55.405) + = 335.124

Total of 3 streams to confluence:
Flow rates before confluence point:
259.305 35.655 55.405
Maximum flow rates at confluence using above data:
343.395 339.603 335.124
Area of streams before confluence:
125.149 17.500 27.500
Effective area values after confluence:
170.149 159.257 151.380
Results of confluence:
Total flow rate = 343.395(CFS)
Time of concentration = 20.180 min.
Effective stream area after confluence = 170.149(Ac.)

```
Stream Area average Pervious fraction(Ap) =  0.113
Stream Area average soil loss rate(Fm) =    0.085(In/Hr)
Study area (this main stream) =     170.15(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       56.000 to Point/Station       57.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1043.300(Ft.)
Downstream point/station elevation =  1041.300(Ft.)
Pipe length  =   640.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   343.395(CFS)
Given pipe size =     84.00(In.)
Calculated individual pipe flow  =   343.395(CFS)
Normal flow depth in pipe =   66.09(In.)
Flow top width inside pipe =   68.80(In.)
Critical Depth =   58.60(In.)
Pipe flow velocity =     10.57(Ft/s)
Travel time through pipe =    1.01 min.
Time of concentration (TC) =    21.19 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       57.000 to Point/Station       57.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    170.149(Ac.)
Runoff from this stream =    343.395(CFS)
Time of concentration =   21.19 min.
Rainfall intensity =     2.049(In/Hr)
Area averaged loss rate (Fm) =    0.0854(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1128


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      136.000 to Point/Station      137.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1091.600(Ft.)
Bottom (of initial area) elevation =  1086.600(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.902 min.
Rainfall intensity =      2.638(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.875
Subarea runoff =     12.696(CFS)
Total initial stream area =        5.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.073(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      137.000 to Point/Station      138.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
Top of street segment elevation =  1086.600(Ft.)
End of street segment elevation =  1074.600(Ft.)
Length of street segment  =   875.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     25.391(CFS)
Depth of flow =   0.460(Ft.), Average velocity =   3.725(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  18.268(Ft.)
Flow velocity =   3.72(Ft/s)
Travel time =    3.92 min.     TC =   17.82  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Rainfall intensity =      2.273(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.871
Subarea runoff =     19.972(CFS) for   11.000(Ac.)
Total runoff =     32.668(CFS)
Effective area this stream =       16.50(Ac.)
Total Study Area (Main Stream No. 1) =      193.09(Ac.)
Area averaged Fm value =    0.073(In/Hr)
Street flow at end of street =     32.668(CFS)
Half street flow at end of street =     16.334(CFS)
Depth of flow =   0.497(Ft.), Average velocity =   3.974(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      138.000 to Point/Station       57.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1067.600(Ft.)
Downstream point/station elevation =  1041.300(Ft.)
Pipe length  =  1320.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    32.668(CFS)
Given pipe size =     30.00(In.)
Calculated individual pipe flow  =    32.668(CFS)
```

```
Normal flow depth in pipe =   16.13(In.)
Flow top width inside pipe =   29.92(In.)
Critical Depth =   23.34(In.)
Pipe flow velocity =     12.15(Ft/s)
Travel time through pipe =    1.81 min.
Time of concentration (TC) =    19.63 min.

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       57.000 to Point/Station       57.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     16.500(Ac.)
Runoff from this stream =     32.668(CFS)
Time of concentration =   19.63 min.
Rainfall intensity =     2.145(In/Hr)
Area averaged loss rate (Fm) =    0.0734(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      139.000 to Point/Station      140.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1074.700(Ft.)
Bottom (of initial area) elevation =  1069.700(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.902 min.
Rainfall intensity =      2.638(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.875
Subarea runoff =     12.696(CFS)
Total initial stream area =        5.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.073(In/Hr)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      140.000 to Point/Station      141.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
Top of street segment elevation =  1069.700(Ft.)
End of street segment elevation =  1065.300(Ft.)
Length of street segment  =   875.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     25.391(CFS)
Depth of flow =   0.530(Ft.), Average velocity =   2.657(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 =   2.66(Ft/s)
Travel time =    5.49 min.     TC =   19.39  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Rainfall intensity =      2.161(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.869
Subarea runoff =     18.301(CFS) for   11.000(Ac.)
Total runoff =     30.997(CFS)
Effective area this stream =       16.50(Ac.)
Total Study Area (Main Stream No. 1) =      209.59(Ac.)
Area averaged Fm value =    0.073(In/Hr)
Street flow at end of street =     30.997(CFS)
Half street flow at end of street =     15.498(CFS)
Depth of flow =   0.561(Ft.), Average velocity =   2.876(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      141.000 to Point/Station      141.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =     16.500(Ac.)
Runoff from this stream =     30.997(CFS)
Time of concentration =   19.39 min.
Rainfall intensity =     2.161(In/Hr)
Area averaged loss rate (Fm) =    0.0734(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

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


1      343.395     21.19              2.049
2       32.668     19.63              2.145
3       30.997     19.39              2.161
Qmax(1) =
         1.000 *    1.000 *   343.395) +
         0.954 *    1.000 *    32.668) +
         0.946 *    1.000 *    30.997) + =     403.878
```

```
Qmax(2) =
        1.049 *    0.926 *   343.395) +
        1.000 *    1.000 *    32.668) +
        0.992 *    1.000 *    30.997) + =     397.121
Qmax(3) =
        1.057 *    0.915 *   343.395) +
        1.008 *    0.988 *    32.668) +
        1.000 *    1.000 *    30.997) + =     395.682

Total of 3 streams to confluence:
Flow rates before confluence point:
     343.395      32.668      30.997
Maximum flow rates at confluence using above data:
      403.878      397.121      395.682
Area of streams before confluence:
      170.149       16.500       16.500
Effective area values after confluence:
      203.149      190.611      188.502
Results of confluence:
Total flow rate =    403.878(CFS)
Time of concentration =    21.190 min.
Effective stream area after confluence =    203.149(Ac.)
Stream Area average Pervious fraction(Ap) =  0.111
Stream Area average soil loss rate(Fm) =    0.083(In/Hr)
Study area (this main stream) =     203.15(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       57.000 to Point/Station       63.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1041.300(Ft.)
Downstream point/station elevation =  1039.500(Ft.)
Pipe length  =   560.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   403.878(CFS)
Given pipe size =     92.00(In.)
Calculated individual pipe flow  =   403.878(CFS)
Normal flow depth in pipe =   66.66(In.)
Flow top width inside pipe =   82.20(In.)
Critical Depth =   62.03(In.)
Pipe flow velocity =     11.27(Ft/s)
Travel time through pipe =    0.83 min.
Time of concentration (TC) =    22.02 min.
End of computations, Total Study Area =          209.59 (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) = 0.111
Area averaged SCS curve number =  53.8
```

LINE "DZ-1"

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
Rational Hydrology Study Date: 01/13/05

FONTANA / LINE DZ-1 HYDROLOGY
25 YEAR STORM
JN 04339

Hall & Forman, Inc. - S/N 950

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

Rational hydrology study storm event year is 25.0
10 Year storm 1 hour rainfall = 0.930(In.)
100 Year storm 1 hour rainfall = 1.350(In.)
Computed rainfall intensity:
Storm year = 25.00 1 hour rainfall = 1.097 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

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

COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 56.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.073(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 1068.100(Ft.)
Bottom (of initial area) elevation = 1063.100(Ft.)
Difference in elevation = 5.000(Ft.)
Slope = 0.00500 s(%)= 0.50
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 13.902 min.
Rainfall intensity = 2.638(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.875
Subarea runoff = 11.541(CFS)
Total initial stream area = 5.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.073(In/Hr)

++
Process from Point/Station 301.000 to Point/Station 302.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1063.100(Ft.)
End of street segment elevation = 1060.000(Ft.)
Length of street segment = 620.000(Ft.)

```
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(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 [1] side(s) of the street
Distance from curb to property line  =  13.000(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 =     28.277(CFS)
Depth of flow =   0.703(Ft.), Average velocity =   3.027(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    1.81(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  30.392(Ft.)
Flow velocity =   3.03(Ft/s)
Travel time =    3.41 min.     TC =   17.32  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Rainfall intensity =      2.313(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.871
Subarea runoff =     27.756(CFS) for   14.500(Ac.)
Total runoff =     39.297(CFS)
Effective area this stream =       19.50(Ac.)
Total Study Area (Main Stream No. 1) =       19.50(Ac.)
Area averaged Fm value =    0.073(In/Hr)
Street flow at end of street =     39.297(CFS)
Half street flow at end of street =     39.297(CFS)
Depth of flow =   0.789(Ft.), Average velocity =   3.146(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    6.12(Ft.)
Flow width (from curb towards crown)=  34.707(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station       65.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1055.000(Ft.)
Downstream point/station elevation =  1051.700(Ft.)
Pipe length  =   660.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    39.297(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =    39.297(CFS)
Normal flow depth in pipe =   25.13(In.)
Flow top width inside pipe =   33.06(In.)
Critical Depth =   24.50(In.)
Pipe flow velocity =      7.47(Ft/s)
Travel time through pipe =    1.47 min.
Time of concentration (TC) =    18.79 min.
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       65.000 to Point/Station       65.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      19.500(Ac.)
Runoff from this stream =      39.297(CFS)
Time of concentration =   18.79 min.
Rainfall intensity =     2.202(In/Hr)
Area averaged loss rate (Fm) =    0.0734(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      304.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1064.500(Ft.)
Bottom (of initial area) elevation =  1060.000(Ft.)
Difference in elevation =     4.500(Ft.)
Slope =    0.00450  s(%)=       0.45
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   18.168 min.
Rainfall intensity =      2.247(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.753
Subarea runoff =     13.535(CFS)
Total initial stream area =        8.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.367(In/Hr)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      304.000 to Point/Station      304.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      8.000(Ac.)
Runoff from this stream =     13.535(CFS)
Time of concentration =   18.17 min.
Rainfall intensity =     2.247(In/Hr)
Area averaged loss rate (Fm) =    0.3670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

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

1         39.297      18.79                  2.202
2         13.535      18.17                  2.247
```

```
Qmax(1) =
        1.000 *    1.000 *    39.297) +
        0.976 *    1.000 *    13.535) + =      52.509
Qmax(2) =
        1.021 *    0.967 *    39.297) +
        1.000 *    1.000 *    13.535) + =      52.334

Total of 2 streams to confluence:
Flow rates before confluence point:
     39.297      13.535
Maximum flow rates at confluence using above data:
      52.509       52.334
Area of streams before confluence:
      19.500        8.000
Effective area values after confluence:
      27.500       26.856
Results of confluence:
Total flow rate =     52.509(CFS)
Time of concentration =    18.789 min.
Effective stream area after confluence =     27.500(Ac.)
Stream Area average Pervious fraction(Ap) =  0.216
Stream Area average soil loss rate(Fm) =    0.159(In/Hr)
Study area (this main stream) =      27.50(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       65.000 to Point/Station       66.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1051.700(Ft.)
Downstream point/station elevation =  1048.400(Ft.)
Pipe length  =   660.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    52.509(CFS)
Given pipe size =     48.00(In.)
Calculated individual pipe flow  =    52.509(CFS)
Normal flow depth in pipe =   24.47(In.)
Flow top width inside pipe =   47.99(In.)
Critical Depth =   26.14(In.)
Pipe flow velocity =      8.15(Ft/s)
Travel time through pipe =    1.35 min.
Time of concentration (TC) =    20.14 min.


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Process from Point/Station       66.000 to Point/Station       66.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     27.500(Ac.)
Runoff from this stream =     52.509(CFS)
Time of concentration =   20.14 min.
Rainfall intensity =     2.112(In/Hr)
Area averaged loss rate (Fm) =    0.1588(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2164


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      306.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
SCHOOL subarea
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.6000     Max loss rate(Fm)=     0.440(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1062.000(Ft.)
Bottom (of initial area) elevation =  1055.400(Ft.)
Difference in elevation =     6.600(Ft.)
Slope =    0.00660  s(%)=       0.66
TC = k(0.412)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.823 min.
Rainfall intensity =      2.273(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.726
Subarea runoff =     13.193(CFS)
Total initial stream area =        8.000(Ac.)
Pervious area fraction = 0.600
Initial area Fm value =    0.440(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      306.000 to Point/Station      306.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      8.000(Ac.)
Runoff from this stream =     13.193(CFS)
Time of concentration =   17.82 min.
Rainfall intensity =     2.273(In/Hr)
Area averaged loss rate (Fm) =    0.4404(In/Hr)
Area averaged Pervious ratio (Ap) = 0.6000


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Process from Point/Station      307.000 to Point/Station      308.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1070.100(Ft.)
Bottom (of initial area) elevation =  1065.100(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.275(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.755
Subarea runoff =      8.588(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.367(In/Hr)
```

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Process from Point/Station      308.000 to Point/Station      309.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1065.100(Ft.)
End of street segment elevation =  1062.700(Ft.)
Length of street segment  =   650.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     17.176(CFS)
Depth of flow =   0.499(Ft.), Average velocity =   2.073(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 =   2.07(Ft/s)
Travel time =    5.23 min.     TC =   23.02  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Rainfall intensity =      1.950(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.731
Subarea runoff =     12.777(CFS) for   10.000(Ac.)
Total runoff =     21.365(CFS)
Effective area this stream =       15.00(Ac.)
Total Study Area (Main Stream No. 1) =       50.50(Ac.)
Area averaged Fm value =    0.367(In/Hr)
Street flow at end of street =     21.365(CFS)
Half street flow at end of street =     10.682(CFS)
Depth of flow =   0.528(Ft.), Average velocity =   2.260(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      309.000 to Point/Station      310.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1062.700(Ft.)
End of street segment elevation =  1055.400(Ft.)
Length of street segment  =  1450.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     32.047(CFS)
Depth of flow =   0.566(Ft.), Average velocity =   2.915(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 =   2.92(Ft/s)
Travel time =    8.29 min.     TC =   31.31  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Rainfall intensity =      1.621(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.696
Subarea runoff =     12.494(CFS) for   15.000(Ac.)
Total runoff =     33.859(CFS)
Effective area this stream =       30.00(Ac.)
Total Study Area (Main Stream No. 1) =       65.50(Ac.)
Area averaged Fm value =    0.367(In/Hr)
Street flow at end of street =     33.859(CFS)
Half street flow at end of street =     16.929(CFS)
Depth of flow =   0.576(Ft.), Average velocity =   2.980(Ft/s)
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      310.000 to Point/Station      310.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =     30.000(Ac.)
Runoff from this stream =     33.859(CFS)
Time of concentration =   31.31 min.
Rainfall intensity =     1.621(In/Hr)
Area averaged loss rate (Fm) =    0.3670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

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


1        52.509      20.14              2.112
2        13.193      17.82              2.273
3        33.859      31.31              1.621
Qmax(1) =
```

```
          1.000 *    1.000 *    52.509) +
          0.912 *    1.000 *    13.193) +
          1.392 *    0.643 *    33.859) + =      94.859
Qmax(2) =
          1.082 *    0.885 *    52.509) +
          1.000 *    1.000 *    13.193) +
          1.520 *    0.569 *    33.859) + =      92.783
Qmax(3) =
          0.749 *    1.000 *    52.509) +
          0.644 *    1.000 *    13.193) +
          1.000 *    1.000 *    33.859) + =      81.665

Total of 3 streams to confluence:
Flow rates before confluence point:
      52.509      13.193      33.859
Maximum flow rates at confluence using above data:
       94.859       92.783       81.665
Area of streams before confluence:
       27.500        8.000       30.000
Effective area values after confluence:
       54.799       49.419       65.500
Results of confluence:
Total flow rate =      94.859(CFS)
Time of concentration =    20.139 min.
Effective stream area after confluence =      54.799(Ac.)
Stream Area average Pervious fraction(Ap) =  0.393
Stream Area average soil loss rate(Fm) =    0.289(In/Hr)
Study area (this main stream) =      65.50(Ac.)


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Process from Point/Station       66.000 to Point/Station       67.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1048.400(Ft.)
Downstream point/station elevation =  1044.600(Ft.)
Pipe length  =   760.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    94.859(CFS)
Given pipe size =     54.00(In.)
Calculated individual pipe flow  =    94.859(CFS)
Normal flow depth in pipe =   32.72(In.)
Flow top width inside pipe =   52.77(In.)
Critical Depth =   34.30(In.)
Pipe flow velocity =      9.41(Ft/s)
Travel time through pipe =    1.35 min.
Time of concentration (TC) =    21.49 min.


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Process from Point/Station       67.000 to Point/Station       67.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     54.799(Ac.)
Runoff from this stream =     94.859(CFS)
Time of concentration =   21.49 min.
Rainfall intensity =     2.032(In/Hr)
Area averaged loss rate (Fm) =    0.2885(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3931
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Process from Point/Station      311.000 to Point/Station      312.000
**** INITIAL AREA EVALUATION ****

-------------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1062.400(Ft.)
Bottom (of initial area) elevation =  1057.400(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.275(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.755
Subarea runoff =     13.741(CFS)
Total initial stream area =        8.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.367(In/Hr)


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Process from Point/Station      312.000 to Point/Station      313.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

-------------------------------------------------------------------------------
Top of street segment elevation =  1057.400(Ft.)
End of street segment elevation =  1052.600(Ft.)
Length of street segment  =   960.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     20.611(CFS)
Depth of flow =   0.502(Ft.), Average velocity =   2.442(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 =   2.44(Ft/s)
Travel time =    6.55 min.     TC =   24.34  min.
 Adding area flow to street
SCHOOL subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
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Pervious ratio(Ap) = 0.6000     Max loss rate(Fm)=     0.440(In/Hr)
Rainfall intensity =      1.885(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.707
Subarea runoff =      7.592(CFS) for    8.000(Ac.)
Total runoff =     21.333(CFS)
Effective area this stream =       16.00(Ac.)
Total Study Area (Main Stream No. 1) =       81.50(Ac.)
Area averaged Fm value =    0.404(In/Hr)
Street flow at end of street =     21.333(CFS)
Half street flow at end of street =     10.666(CFS)
Depth of flow =   0.507(Ft.), Average velocity =   2.475(Ft/s)
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      313.000 to Point/Station      313.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     16.000(Ac.)
Runoff from this stream =     21.333(CFS)
Time of concentration =   24.34 min.
Rainfall intensity =     1.885(In/Hr)
Area averaged loss rate (Fm) =    0.4037(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5500
Summary of stream data:

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


1        94.859     21.49                2.032
2        21.333     24.34                1.885
Qmax(1) =
          1.000 *    1.000 *    94.859) +
          1.099 *    0.883 *    21.333) + =     115.552
Qmax(2) =
          0.916 *    1.000 *    94.859) +
          1.000 *    1.000 *    21.333) + =     108.212

Total of 2 streams to confluence:
Flow rates before confluence point:
      94.859      21.333
Maximum flow rates at confluence using above data:
      115.552      108.212
Area of streams before confluence:
       54.799       16.000
Effective area values after confluence:
       68.921       70.799
Results of confluence:
Total flow rate =    115.552(CFS)
Time of concentration =    21.485 min.
Effective stream area after confluence =     68.921(Ac.)
Stream Area average Pervious fraction(Ap) =  0.429
Stream Area average soil loss rate(Fm) =    0.315(In/Hr)
Study area (this main stream) =      70.80(Ac.)


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Process from Point/Station       67.000 to Point/Station       68.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1044.600(Ft.)
Downstream point/station elevation =  1040.800(Ft.)
Pipe length  =   760.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   115.552(CFS)
Given pipe size =     60.00(In.)
Calculated individual pipe flow  =   115.552(CFS)
Normal flow depth in pipe =   34.45(In.)
Flow top width inside pipe =   59.34(In.)
Critical Depth =   36.80(In.)
Pipe flow velocity =      9.91(Ft/s)
Travel time through pipe =    1.28 min.
Time of concentration (TC) =    22.76 min.


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Process from Point/Station       68.000 to Point/Station       68.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Effective stream flow area =     68.921(Ac.)
Total study area this main stream =     81.500(Ac.)
Runoff from this stream =    115.552(CFS)
Time of concentration =   22.76 min.
Rainfall intensity =     1.962(In/Hr)
Area averaged loss rate (Fm) =    0.3146(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4286
Program is now starting with Main Stream No. 2


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Process from Point/Station      314.000 to Point/Station      315.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1079.500(Ft.)
Bottom (of initial area) elevation =  1074.500(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =     2.275(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.755
Subarea runoff =      8.588(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.367(In/Hr)


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Process from Point/Station      315.000 to Point/Station      318.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
Top of street segment elevation =  1074.500(Ft.)
End of street segment elevation =  1069.500(Ft.)
Length of street segment  =  1000.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     15.888(CFS)
Depth of flow =   0.465(Ft.), Average velocity =   2.269(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  18.520(Ft.)
Flow velocity =   2.27(Ft/s)
Travel time =    7.35 min.     TC =   25.13  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Rainfall intensity =      1.849(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.721
Subarea runoff =      9.421(CFS) for    8.500(Ac.)
Total runoff =     18.009(CFS)
Effective area this stream =       13.50(Ac.)
Total Study Area (Main Stream No. 2) =       13.50(Ac.)
Area averaged Fm value =    0.367(In/Hr)
Street flow at end of street =     18.009(CFS)
Half street flow at end of street =      9.005(CFS)
Depth of flow =   0.484(Ft.), Average velocity =   2.340(Ft/s)
Flow width (from curb towards crown)=  19.433(Ft.)


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Process from Point/Station      318.000 to Point/Station      318.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     13.500(Ac.)
Runoff from this stream =     18.009(CFS)
Time of concentration =   25.13 min.
Rainfall intensity =     1.849(In/Hr)
Area averaged loss rate (Fm) =    0.3670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000


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Process from Point/Station      316.000 to Point/Station      317.000
**** INITIAL AREA EVALUATION ****
-------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1079.500(Ft.)
Bottom (of initial area) elevation =  1074.500(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.275(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.755
Subarea runoff =      8.588(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.367(In/Hr)


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Process from Point/Station      317.000 to Point/Station      318.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
-------------------------------------------------------------------------
Top of street segment elevation =  1074.500(Ft.)
End of street segment elevation =  1069.500(Ft.)
Length of street segment  =  1000.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     16.317(CFS)
Depth of flow =   0.469(Ft.), Average velocity =   2.284(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  18.711(Ft.)
Flow velocity =   2.28(Ft/s)
Travel time =    7.30 min.     TC =   25.09  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Rainfall intensity =      1.851(In/Hr) for a    25.0 year storm
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```
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.722
Subarea runoff =     10.115(CFS) for    9.000(Ac.)
Total runoff =     18.703(CFS)
Effective area this stream =       14.00(Ac.)
Total Study Area (Main Stream No. 2) =       27.50(Ac.)
Area averaged Fm value =    0.367(In/Hr)
Street flow at end of street =     18.703(CFS)
Half street flow at end of street =      9.351(CFS)
Depth of flow =   0.489(Ft.), Average velocity =   2.362(Ft/s)
Flow width (from curb towards crown)=  19.717(Ft.)


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Process from Point/Station      318.000 to Point/Station      318.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     14.000(Ac.)
Runoff from this stream =     18.703(CFS)
Time of concentration =   25.09 min.
Rainfall intensity =     1.851(In/Hr)
Area averaged loss rate (Fm) =    0.3670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

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


1       18.009     25.13                1.849
2       18.703     25.09                1.851
Qmax(1) =
          1.000 *    1.000 *    18.009) +
          0.999 *    1.000 *    18.703) + =      36.685
Qmax(2) =
          1.001 *    0.998 *    18.009) +
          1.000 *    1.000 *    18.703) + =      36.703

Total of 2 streams to confluence:
Flow rates before confluence point:
      18.009      18.703
Maximum flow rates at confluence using above data:
       36.685      36.703
Area of streams before confluence:
       13.500      14.000
Effective area values after confluence:
       27.500      27.474
Results of confluence:
Total flow rate =     36.703(CFS)
Time of concentration =    25.087 min.
Effective stream area after confluence =     27.474(Ac.)
Stream Area average Pervious fraction(Ap) =  0.500
Stream Area average soil loss rate(Fm) =    0.367(In/Hr)
Study area (this main stream) =      27.50(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      318.000 to Point/Station      319.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
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Top of street segment elevation =  1069.500(Ft.)
End of street segment elevation =  1063.000(Ft.)
Length of street segment  =  1300.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     49.061(CFS)
Depth of flow =   0.648(Ft.), Average velocity =   3.444(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 =   3.44(Ft/s)
Travel time =    6.29 min.     TC =   31.38  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Rainfall intensity =      1.619(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.696
Subarea runoff =     15.091(CFS) for   18.500(Ac.)
Total runoff =     51.795(CFS)
Effective area this stream =       45.97(Ac.)
Total Study Area (Main Stream No. 2) =       46.00(Ac.)
Area averaged Fm value =    0.367(In/Hr)
Street flow at end of street =     51.795(CFS)
Half street flow at end of street =     25.897(CFS)
Depth of flow =   0.659(Ft.), Average velocity =   3.519(Ft/s)
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      319.000 to Point/Station       68.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1054.800(Ft.)
Downstream point/station elevation =  1041.800(Ft.)
Pipe length  =   900.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    51.795(CFS)
Given pipe size =     48.00(In.)
Calculated individual pipe flow  =    51.795(CFS)
Normal flow depth in pipe =   18.02(In.)
Flow top width inside pipe =   46.49(In.)
Critical Depth =   25.91(In.)
Pipe flow velocity =     12.01(Ft/s)
Travel time through pipe =    1.25 min.
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Time of concentration (TC) =    32.63 min.


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Process from Point/Station       68.000 to Point/Station       68.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Effective stream flow area =     45.974(Ac.)
Total study area this main stream =     46.000(Ac.)
Runoff from this stream =     51.795(CFS)
Time of concentration =   32.63 min.
Rainfall intensity =     1.581(In/Hr)
Area averaged loss rate (Fm) =    0.3670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

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


1      115.552     22.76                1.962
2       51.795     32.63                1.581
Qmax(1) =
         1.000 *    1.000 *   115.552) +
         1.314 *    0.698 *    51.795) + =     163.034
Qmax(2) =
         0.769 *    1.000 *   115.552) +
         1.000 *    1.000 *    51.795) + =     140.618

Total of 2 main streams to confluence:
Flow rates before confluence point:
     116.552      52.795
Maximum flow rates at confluence using above data:
      163.034      140.618
Effective Area of streams before confluence:
       68.921       45.974
Effective area values after confluence:
      100.998      114.895


Results of confluence:
Total flow rate =    163.034(CFS)
Time of concentration =    22.764 min.
Effective stream area after confluence  =    100.998(Ac.)
Stream Area average Pervious fraction(Ap) =  0.457
Stream Area average soil loss rate(Fm) =    0.336(In/Hr)
Steam effective area =     114.90(Ac.)


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Process from Point/Station       68.000 to Point/Station       68.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    100.998(Ac.)
Runoff from this stream =    163.034(CFS)
Time of concentration =   22.76 min.
Rainfall intensity =     1.962(In/Hr)
Area averaged loss rate (Fm) =    0.3355(In/Hr)
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Area averaged Pervious ratio (Ap) = 0.4572

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Process from Point/Station      320.000 to Point/Station      321.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1057.100(Ft.)
Bottom (of initial area) elevation =  1052.100(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.275(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.755
Subarea runoff =     11.164(CFS)
Total initial stream area =        6.500(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.367(In/Hr)

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Process from Point/Station      321.000 to Point/Station      321.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      6.500(Ac.)
Runoff from this stream =     11.164(CFS)
Time of concentration =   17.79 min.
Rainfall intensity =     2.275(In/Hr)
Area averaged loss rate (Fm) =    0.3670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000

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Process from Point/Station      322.000 to Point/Station      323.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1057.100(Ft.)
Bottom (of initial area) elevation =  1052.100(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
```

```
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.275(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.755
Subarea runoff =      8.588(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.367(In/Hr)

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Process from Point/Station      323.000 to Point/Station      323.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      5.000(Ac.)
Runoff from this stream =      8.588(CFS)
Time of concentration =   17.79 min.
Rainfall intensity =     2.275(In/Hr)
Area averaged loss rate (Fm) =    0.3670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

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


1       163.034      22.76                1.962
2        11.164      17.79                2.275
3         8.588      17.79                2.275
Qmax(1) =
          1.000 *     1.000 *   163.034) +
          0.836 *     1.000 *    11.164) +
          0.836 *     1.000 *     8.588) + =      179.547
Qmax(2) =
          1.192 *     0.781 *   163.034) +
          1.000 *     1.000 *    11.164) +
          1.000 *     1.000 *     8.588) + =      171.663
Qmax(3) =
          1.192 *     0.781 *   163.034) +
          1.000 *     1.000 *    11.164) +
          1.000 *     1.000 *     8.588) + =      171.663

Total of 3 streams to confluence:
Flow rates before confluence point:
     163.034      11.164       8.588
Maximum flow rates at confluence using above data:
      179.547      171.663      171.663
Area of streams before confluence:
      100.998        6.500        5.000
Effective area values after confluence:
      112.498       90.426       90.426
Results of confluence:
Total flow rate =    179.547(CFS)
Time of concentration =    22.764 min.
Effective stream area after confluence =     112.498(Ac.)
Stream Area average Pervious fraction(Ap) =  0.462
Stream Area average soil loss rate(Fm) =    0.339(In/Hr)
Study area (this main stream) =     112.50(Ac.)

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Process from Point/Station       68.000 to Point/Station       69.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1040.800(Ft.)
Downstream point/station elevation =  1038.800(Ft.)
Pipe length  =   400.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   179.547(CFS)
Given pipe size =     84.00(In.)
Calculated individual pipe flow  =   179.547(CFS)
Normal flow depth in pipe =   36.80(In.)
Flow top width inside pipe =   83.35(In.)
Critical Depth =   41.80(In.)
Pipe flow velocity =     11.06(Ft/s)
Travel time through pipe =    0.60 min.
Time of concentration (TC) =    23.37 min.


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Process from Point/Station       69.000 to Point/Station       69.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    112.498(Ac.)
Runoff from this stream =    179.547(CFS)
Time of concentration =   23.37 min.
Rainfall intensity =     1.932(In/Hr)
Area averaged loss rate (Fm) =    0.3387(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4615


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Process from Point/Station      324.000 to Point/Station      325.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1055.000(Ft.)
Bottom (of initial area) elevation =  1050.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.275(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.755
Subarea runoff =     13.741(CFS)
Total initial stream area =        8.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.367(In/Hr)


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Process from Point/Station      325.000 to Point/Station      325.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
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```
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      8.000(Ac.)
Runoff from this stream =     13.741(CFS)
Time of concentration =   17.79 min.
Rainfall intensity =     2.275(In/Hr)
Area averaged loss rate (Fm) =    0.3670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000

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Process from Point/Station      326.000 to Point/Station      327.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1055.000(Ft.)
Bottom (of initial area) elevation =  1050.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.275(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.755
Subarea runoff =     12.023(CFS)
Total initial stream area =        7.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.367(In/Hr)

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Process from Point/Station      327.000 to Point/Station      327.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      7.000(Ac.)
Runoff from this stream =     12.023(CFS)
Time of concentration =   17.79 min.
Rainfall intensity =     2.275(In/Hr)
Area averaged loss rate (Fm) =    0.3670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

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

1       179.547      23.37                1.932
2        13.741      17.79                2.275
3        12.023      17.79                2.275
Qmax(1) =
          1.000 *     1.000 *    179.547) +
          0.820 *     1.000 *     13.741) +
          0.820 *     1.000 *     12.023) + =      200.674
Qmax(2) =
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          1.216 *    0.761 *   179.547) +
          1.000 *    1.000 *    13.741) +
          1.000 *    1.000 *    12.023) + =     191.922
Qmax(3) =
          1.216 *    0.761 *   179.547) +
          1.000 *    1.000 *    13.741) +
          1.000 *    1.000 *    12.023) + =     191.922

Total of 3 streams to confluence:
Flow rates before confluence point:
     179.547      13.741      12.023
Maximum flow rates at confluence using above data:
      200.674      191.922      191.922
Area of streams before confluence:
      112.498        8.000        7.000
Effective area values after confluence:
      127.498      100.646      100.646
Results of confluence:
Total flow rate =    200.674(CFS)
Time of concentration =    23.366 min.
Effective stream area after confluence =    127.498(Ac.)
Stream Area average Pervious fraction(Ap) =  0.466
Stream Area average soil loss rate(Fm) =    0.342(In/Hr)
Study area (this main stream) =     127.50(Ac.)


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Process from Point/Station       69.000 to Point/Station       70.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1038.800(Ft.)
Downstream point/station elevation =  1034.600(Ft.)
Pipe length  =   880.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   200.674(CFS)
Given pipe size =     96.00(In.)
Calculated individual pipe flow  =   200.674(CFS)
Normal flow depth in pipe =   37.22(In.)
Flow top width inside pipe =   93.55(In.)
Critical Depth =   42.53(In.)
Pipe flow velocity =     11.14(Ft/s)
Travel time through pipe =    1.32 min.
Time of concentration (TC) =    24.68 min.


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Process from Point/Station       70.000 to Point/Station       70.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    127.498(Ac.)
Runoff from this stream =    200.674(CFS)
Time of concentration =   24.68 min.
Rainfall intensity =     1.869(In/Hr)
Area averaged loss rate (Fm) =    0.3421(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4661


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Process from Point/Station      328.000 to Point/Station      329.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
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```
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1057.800(Ft.)
Bottom (of initial area) elevation =  1052.800(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.275(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.755
Subarea runoff =      8.588(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.367(In/Hr)


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Process from Point/Station      329.000 to Point/Station      330.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1052.800(Ft.)
End of street segment elevation =  1048.800(Ft.)
Length of street segment  =   800.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     18.893(CFS)
Depth of flow =   0.491(Ft.), Average velocity =   2.368(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  19.793(Ft.)
Flow velocity =   2.37(Ft/s)
Travel time =    5.63 min.     TC =   23.42  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Rainfall intensity =      1.929(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.729
Subarea runoff =     15.316(CFS) for   12.000(Ac.)
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Total runoff =     23.904(CFS)
Effective area this stream =       17.00(Ac.)
Total Study Area (Main Stream No. 1) =       89.50(Ac.)
Area averaged Fm value =    0.367(In/Hr)
Street flow at end of street =     23.904(CFS)
Half street flow at end of street =     11.952(CFS)
Depth of flow =   0.522(Ft.), Average velocity =   2.590(Ft/s)
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      330.000 to Point/Station      331.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
Top of street segment elevation =  1048.800(Ft.)
End of street segment elevation =  1045.500(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     35.856(CFS)
Depth of flow =   0.586(Ft.), Average velocity =   3.042(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 =   3.04(Ft/s)
Travel time =    3.62 min.     TC =   27.04  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Rainfall intensity =      1.770(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.713
Subarea runoff =     19.031(CFS) for   17.000(Ac.)
Total runoff =     42.935(CFS)
Effective area this stream =       34.00(Ac.)
Total Study Area (Main Stream No. 1) =      106.50(Ac.)
Area averaged Fm value =    0.367(In/Hr)
Street flow at end of street =     42.935(CFS)
Half street flow at end of street =     21.467(CFS)
Depth of flow =   0.620(Ft.), Average velocity =   3.267(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      331.000 to Point/Station       70.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1038.600(Ft.)
Downstream point/station elevation =  1034.600(Ft.)
Pipe length  =   800.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    42.935(CFS)
Given pipe size =     42.00(In.)
Calculated individual pipe flow  =    42.935(CFS)
Normal flow depth in pipe =   23.53(In.)
Flow top width inside pipe =   41.69(In.)
Critical Depth =   24.51(In.)
Pipe flow velocity =      7.74(Ft/s)
Travel time through pipe =    1.72 min.
Time of concentration (TC) =    28.76 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       70.000 to Point/Station       70.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     34.000(Ac.)
Runoff from this stream =     42.935(CFS)
Time of concentration =   28.76 min.
Rainfall intensity =     1.706(In/Hr)
Area averaged loss rate (Fm) =    0.3670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      332.000 to Point/Station      333.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1053.200(Ft.)
Bottom (of initial area) elevation =  1048.200(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.275(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.755
Subarea runoff =      8.588(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.367(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      333.000 to Point/Station      334.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
```

```
Top of street segment elevation =  1048.200(Ft.)
End of street segment elevation =  1045.600(Ft.)
Length of street segment  =   520.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     15.458(CFS)
Depth of flow =   0.462(Ft.), Average velocity =   2.254(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  18.326(Ft.)
Flow velocity =   2.25(Ft/s)
Travel time =    3.85 min.     TC =   21.63  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Rainfall intensity =      2.023(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.737
Subarea runoff =     10.791(CFS) for    8.000(Ac.)
Total runoff =     19.379(CFS)
Effective area this stream =       13.00(Ac.)
Total Study Area (Main Stream No. 1) =      119.50(Ac.)
Area averaged Fm value =    0.367(In/Hr)
Street flow at end of street =     19.379(CFS)
Half street flow at end of street =      9.689(CFS)
Depth of flow =   0.495(Ft.), Average velocity =   2.383(Ft/s)
Flow width (from curb towards crown)=  19.986(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      334.000 to Point/Station      334.000
**** CONFLUENCE OF MINOR STREAMS ****
--------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =     13.000(Ac.)
Runoff from this stream =     19.379(CFS)
Time of concentration =   21.63 min.
Rainfall intensity =     2.023(In/Hr)
Area averaged loss rate (Fm) =    0.3670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      335.000 to Point/Station      336.000
**** INITIAL AREA EVALUATION ****
```

```
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1053.200(Ft.)
Bottom (of initial area) elevation =  1048.200(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.275(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.755
Subarea runoff =     10.306(CFS)
Total initial stream area =        6.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.367(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      336.000 to Point/Station      337.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1048.200(Ft.)
End of street segment elevation =  1045.600(Ft.)
Length of street segment  =   520.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     21.470(CFS)
Depth of flow =   0.508(Ft.), Average velocity =   2.482(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 =   2.48(Ft/s)
Travel time =    3.49 min.     TC =   21.28  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Rainfall intensity =      2.043(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
```

```
rational method)(Q=KCIA) is C = 0.738
Subarea runoff =      18.361(CFS) for    13.000(Ac.)
Total runoff =      28.667(CFS)
Effective area this stream =       19.00(Ac.)
Total Study Area (Main Stream No. 1) =      138.50(Ac.)
Area averaged Fm value =     0.367(In/Hr)
Street flow at end of street =      28.667(CFS)
Half street flow at end of street =      14.333(CFS)
Depth of flow =   0.549(Ft.), Average velocity =   2.783(Ft/s)
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      337.000 to Point/Station      337.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 4
Stream flow area =      19.000(Ac.)
Runoff from this stream =      28.667(CFS)
Time of concentration =   21.28 min.
Rainfall intensity =      2.043(In/Hr)
Area averaged loss rate (Fm) =     0.3670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

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

1       200.674      24.68                  1.869
2        42.935      28.76                  1.706
3        19.379      21.63                  2.023
4        28.667      21.28                  2.043
Qmax(1) =
          1.000 *     1.000 *   200.674) +
          1.122 *     0.858 *    42.935) +
          0.907 *     1.000 *    19.379) +
          0.896 *     1.000 *    28.667) + =      285.304
Qmax(2) =
          0.893 *     1.000 *   200.674) +
          1.000 *     1.000 *    42.935) +
          0.808 *     1.000 *    19.379) +
          0.799 *     1.000 *    28.667) + =      260.649
Qmax(3) =
          1.101 *     0.876 *   200.674) +
          1.237 *     0.752 *    42.935) +
          1.000 *     1.000 *    19.379) +
          0.988 *     1.000 *    28.667) + =      281.275
Qmax(4) =
          1.114 *     0.862 *   200.674) +
          1.252 *     0.740 *    42.935) +
          1.012 *     0.984 *    19.379) +
          1.000 *     1.000 *    28.667) + =      280.471

Total of 4 streams to confluence:
Flow rates before confluence point:
     200.674      42.935      19.379      28.667
Maximum flow rates at confluence using above data:
      285.304      260.649      281.275      280.471
Area of streams before confluence:
```

```
      127.498        34.000        13.000        19.000
Effective area values after confluence:
      188.681       193.498       169.329       166.874
Results of confluence:
Total flow rate =     285.304(CFS)
Time of concentration =     24.684 min.
Effective stream area after confluence =     188.681(Ac.)
Stream Area average Pervious fraction(Ap) =  0.478
Stream Area average soil loss rate(Fm) =     0.351(In/Hr)
Study area (this main stream) =      193.50(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        70.000 to Point/Station        71.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1034.600(Ft.)
Downstream point/station elevation =  1030.600(Ft.)
Pipe length  =   800.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   285.304(CFS)
Given pipe size =     102.00(In.)
Calculated individual pipe flow  =   285.304(CFS)
Normal flow depth in pipe =   43.36(In.)
Flow top width inside pipe =  100.85(In.)
Critical Depth =   50.20(In.)
Pipe flow velocity =      12.41(Ft/s)
Travel time through pipe =     1.07 min.
Time of concentration (TC) =     25.76 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        71.000 to Point/Station        71.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     188.681(Ac.)
Runoff from this stream =     285.304(CFS)
Time of concentration =   25.76 min.
Rainfall intensity =      1.822(In/Hr)
Area averaged loss rate (Fm) =     0.3506(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4776


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Process from Point/Station       338.000 to Point/Station       339.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=      0.073(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1056.000(Ft.)
Bottom (of initial area) elevation =  1051.000(Ft.)
Difference in elevation =      5.000(Ft.)
Slope =    0.00500  s(%)=        0.50
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
```

```
Initial area time of concentration =   13.902 min.
Rainfall intensity =      2.638(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.875
Subarea runoff =     11.541(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.073(In/Hr)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      339.000 to Point/Station      340.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1051.000(Ft.)
End of street segment elevation =  1048.600(Ft.)
Length of street segment  =   480.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     21.929(CFS)
Depth of flow =   0.511(Ft.), Average velocity =   2.503(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 =   2.50(Ft/s)
Travel time =    3.20 min.     TC =   17.10  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Rainfall intensity =      2.330(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.872
Subarea runoff =     16.893(CFS) for    9.000(Ac.)
Total runoff =     28.434(CFS)
Effective area this stream =       14.00(Ac.)
Total Study Area (Main Stream No. 1) =      152.50(Ac.)
Area averaged Fm value =    0.073(In/Hr)
Street flow at end of street =     28.434(CFS)
Half street flow at end of street =     14.217(CFS)
Depth of flow =   0.548(Ft.), Average velocity =   2.775(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      340.000 to Point/Station      340.000
```

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

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 14.000(Ac.)
Runoff from this stream = 28.434(CFS)
Time of concentration = 17.10 min.
Rainfall intensity = 2.330(In/Hr)
Area averaged loss rate (Fm) = 0.0734(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	285.304	25.76	1.822
2	28.434	17.10	2.330

Qmax(1) =
1.000 * 1.000 * 285.304) +
0.775 * 1.000 * 28.434) + = 307.340
Qmax(2) =
1.345 * 0.664 * 285.304) +
1.000 * 1.000 * 28.434) + = 283.184

Total of 2 streams to confluence:
Flow rates before confluence point:
285.304 28.434
Maximum flow rates at confluence using above data:
307.340 283.184
Area of streams before confluence:
188.681 14.000
Effective area values after confluence:
202.681 139.253
Results of confluence:
Total flow rate = 307.340(CFS)
Time of concentration = 25.758 min.
Effective stream area after confluence = 202.681(Ac.)
Stream Area average Pervious fraction(Ap) = 0.452
Stream Area average soil loss rate(Fm) = 0.331(In/Hr)
Study area (this main stream) = 202.68(Ac.)
End of computations, Total Study Area = 234.00 (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) = 0.450
Area averaged SCS curve number = 56.0

LINE "P3"

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
Rational Hydrology Study Date: 01/13/05

FONTANA / LINE P3 HYDROLOGY
25 YEAR STORM
JN 04339

Hall & Forman, Inc. - S/N 950

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

Rational hydrology study storm event year is 25.0
10 Year storm 1 hour rainfall = 0.930(In.)
100 Year storm 1 hour rainfall = 1.350(In.)
Computed rainfall intensity:
Storm year = 25.00 1 hour rainfall = 1.097 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

++
Process from Point/Station 409.000 to Point/Station 410.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 78.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.404(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 1860.000(Ft.)
Bottom (of initial area) elevation = 1460.000(Ft.)
Difference in elevation = 400.000(Ft.)
Slope = 0.40000 s(%)= 40.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.994 min.
Rainfall intensity = 3.216(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.787
Subarea runoff = 18.984(CFS)
Total initial stream area = 7.500(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.404(In/Hr)

++
Process from Point/Station 410.000 to Point/Station 411.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 42.397(CFS)
Depth of flow = 0.229(Ft.), Average velocity = 9.149(Ft/s)
******* Irregular Channel Data **********

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              20.00
      2             20.00               0.00
      3             40.00               0.00
      4             60.00              20.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =     42.397(CFS)
  '      '    flow top width =     20.458(Ft.)
  '      '    velocity=    9.149(Ft/s)
  '      '    area =      4.634(Sq.Ft)
  '      '    Froude number =     3.387

Upstream point elevation =  1460.000(Ft.)
Downstream point elevation =  1300.000(Ft.)
Flow length =   470.000(Ft.)
Travel time  =    0.86 min.
Time of concentration =   10.85 min.
Depth of flow =   0.229(Ft.)
Average velocity =   9.149(Ft/s)
Total irregular channel flow =    42.397(CFS)
Irregular channel normal depth above invert elev. =   0.229(Ft.)
Average velocity of channel(s) =   9.149(Ft/s)

Sub-Channel No. 1 Critical depth =      0.516(Ft.)
  '      '       '     Critical flow top width =     21.031(Ft.)
  '      '       '     Critical flow velocity=    4.008(Ft/s)
  '      '       '     Critical flow area =     10.578(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      3.061(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.781
Subarea runoff =     43.205(CFS) for   18.500(Ac.)
Total runoff =     62.188(CFS)
Effective area this stream =       26.00(Ac.)
Total Study Area (Main Stream No. 1) =       26.00(Ac.)
Area averaged Fm value =    0.404(In/Hr)


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Process from Point/Station      411.000 to Point/Station      412.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     86.107(CFS)
Depth of flow =   0.421(Ft.), Average velocity =  10.005(Ft/s)
      ******* Irregular Channel Data **********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              20.00
      2             20.00               0.00
```

```
      3              40.00              0.00
      4              60.00             20.00
Manning's 'N' friction factor =   0.035
-----------------------------------------------------------------
Sub-Channel flow  =     86.107(CFS)
  '      '    flow top width =     20.843(Ft.)
  '      '    velocity=   10.005(Ft/s)
  '      '    area =      8.607(Sq.Ft)
  '      '    Froude number =     2.744

Upstream point elevation =  1300.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
Flow length =   650.000(Ft.)
Travel time  =    1.08 min.
Time of concentration =   11.93 min.
Depth of flow =   0.421(Ft.)
Average velocity =  10.005(Ft/s)
Total irregular channel flow =    86.107(CFS)
Irregular channel normal depth above invert elev. =   0.421(Ft.)
Average velocity of channel(s) =  10.005(Ft/s)

Sub-Channel No. 1 Critical depth =      0.820(Ft.)
  '      '       '     Critical flow top width =     21.641(Ft.)
  '      '       '     Critical flow velocity=    5.042(Ft/s)
  '      '       '     Critical flow area =     17.079(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      2.891(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.774
Subarea runoff =     40.807(CFS) for   20.000(Ac.)
Total runoff =    102.995(CFS)
Effective area this stream =       46.00(Ac.)
Total Study Area (Main Stream No. 1) =       46.00(Ac.)
Area averaged Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      412.000 to Point/Station       77.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
-----------------------------------------------------------------------
Upstream point/station elevation =  1152.000(Ft.)
Downstream point/station elevation =  1122.500(Ft.)
Pipe length  =   450.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   102.995(CFS)
Given pipe size =     30.00(In.)
Calculated individual pipe flow  =   102.995(CFS)
Normal flow depth in pipe =   24.09(In.)
Flow top width inside pipe =   23.86(In.)
Critical depth could not be calculated.
Pipe flow velocity =     24.39(Ft/s)
Travel time through pipe =    0.31 min.
Time of concentration (TC) =    12.24 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       77.000 to Point/Station       77.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     46.000(Ac.)
Runoff from this stream =    102.995(CFS)
Time of concentration =   12.24 min.
Rainfall intensity =     2.848(In/Hr)
Area averaged loss rate (Fm) =    0.4035(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      413.000 to Point/Station      414.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Initial subarea data:
Initial area flow distance =   500.000(Ft.)
Top (of initial area) elevation =  1163.300(Ft.)
Bottom (of initial area) elevation =  1129.000(Ft.)
Difference in elevation =    34.300(Ft.)
Slope =    0.06860  s(%)=       6.86
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.985 min.
Rainfall intensity =      3.679(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.810
Subarea runoff =     13.416(CFS)
Total initial stream area =        4.500(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.367(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      414.000 to Point/Station      414.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      4.500(Ac.)
Runoff from this stream =     13.416(CFS)
Time of concentration =    7.98 min.
Rainfall intensity =     3.679(In/Hr)
Area averaged loss rate (Fm) =    0.3670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

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


1       102.995      12.24                2.848
2        13.416       7.98                3.679
Qmax(1) =
```

```
          1.000 *    1.000 *   102.995) +
          0.749 *    1.000 *    13.416) + =     113.041
Qmax(2) =
          1.340 *    0.652 *   102.995) +
          1.000 *    1.000 *    13.416) + =     103.473

Total of 2 streams to confluence:
Flow rates before confluence point:
     102.995      13.416
Maximum flow rates at confluence using above data:
      113.041      103.473
Area of streams before confluence:
       46.000        4.500
Effective area values after confluence:
       50.500       34.507
Results of confluence:
Total flow rate =    113.041(CFS)
Time of concentration =    12.241 min.
Effective stream area after confluence =     50.500(Ac.)
Stream Area average Pervious fraction(Ap) =  0.955
Stream Area average soil loss rate(Fm) =    0.400(In/Hr)
Study area (this main stream) =      50.50(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       77.000 to Point/Station       78.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1122.500(Ft.)
Downstream point/station elevation =  1090.500(Ft.)
Pipe length  =   550.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   113.041(CFS)
Given pipe size =     39.00(In.)
Calculated individual pipe flow  =   113.041(CFS)
Normal flow depth in pipe =   21.05(In.)
Flow top width inside pipe =   38.88(In.)
Critical depth could not be calculated.
Pipe flow velocity =     24.77(Ft/s)
Travel time through pipe =    0.37 min.
Time of concentration (TC) =    12.61 min.


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Process from Point/Station       78.000 to Point/Station       78.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     50.500(Ac.)
Runoff from this stream =    113.041(CFS)
Time of concentration =   12.61 min.
Rainfall intensity =     2.797(In/Hr)
Area averaged loss rate (Fm) =    0.4003(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9554


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      415.000 to Point/Station      416.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
```

```
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Initial subarea data:
Initial area flow distance =   550.000(Ft.)
Top (of initial area) elevation =  1129.000(Ft.)
Bottom (of initial area) elevation =  1097.000(Ft.)
Difference in elevation =    32.000(Ft.)
Slope =    0.05818  s(%)=       5.82
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.573 min.
Rainfall intensity =      3.526(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.806
Subarea runoff =     19.901(CFS)
Total initial stream area =        7.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.367(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      416.000 to Point/Station      416.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      7.000(Ac.)
Runoff from this stream =     19.901(CFS)
Time of concentration =    8.57 min.
Rainfall intensity =     3.526(In/Hr)
Area averaged loss rate (Fm) =    0.3670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000


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Process from Point/Station      417.000 to Point/Station      418.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =   650.000(Ft.)
Top (of initial area) elevation =  1420.000(Ft.)
Bottom (of initial area) elevation =  1120.000(Ft.)
Difference in elevation =   300.000(Ft.)
Slope =    0.46154  s(%)=      46.15
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.175 min.
Rainfall intensity =      3.628(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.800
Subarea runoff =     29.020(CFS)
Total initial stream area =       10.000(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)
```

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Process from Point/Station      418.000 to Point/Station      418.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =     10.000(Ac.)
Runoff from this stream =     29.020(CFS)
Time of concentration =    8.17 min.
Rainfall intensity =     3.628(In/Hr)
Area averaged loss rate (Fm) =    0.4035(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

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


1       113.041      12.61                2.797
2        19.901       8.57                3.526
3        29.020       8.17                3.628
Qmax(1) =
          1.000 *    1.000 *   113.041) +
          0.769 *    1.000 *    19.901) +
          0.742 *    1.000 *    29.020) + =     149.893
Qmax(2) =
          1.304 *    0.680 *   113.041) +
          1.000 *    1.000 *    19.901) +
          0.968 *    1.000 *    29.020) + =     148.217
Qmax(3) =
          1.347 *    0.648 *   113.041) +
          1.032 *    0.954 *    19.901) +
          1.000 *    1.000 *    29.020) + =     147.290

Total of 3 streams to confluence:
Flow rates before confluence point:
     113.041      19.901      29.020
Maximum flow rates at confluence using above data:
      149.893      148.217      147.290
Area of streams before confluence:
       50.500        7.000       10.000
Effective area values after confluence:
       67.500       51.331       49.411
Results of confluence:
Total flow rate =    149.893(CFS)
Time of concentration =    12.611 min.
Effective stream area after confluence =     67.500(Ac.)
Stream Area average Pervious fraction(Ap) =  0.915
Stream Area average soil loss rate(Fm) =    0.397(In/Hr)
Study area (this main stream) =      67.50(Ac.)


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Process from Point/Station       78.000 to Point/Station       79.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1090.500(Ft.)
Downstream point/station elevation =  1060.200(Ft.)
Pipe length  =   900.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   149.893(CFS)
Given pipe size =     48.00(In.)
Calculated individual pipe flow  =   149.893(CFS)
```

```
Normal flow depth in pipe =   25.92(In.)
Flow top width inside pipe =   47.85(In.)
Critical Depth =   43.16(In.)
Pipe flow velocity =     21.64(Ft/s)
Travel time through pipe =    0.69 min.
Time of concentration (TC) =    13.30 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       79.000 to Point/Station       79.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     67.500(Ac.)
Runoff from this stream =    149.893(CFS)
Time of concentration =   13.30 min.
Rainfall intensity =     2.709(In/Hr)
Area averaged loss rate (Fm) =    0.3973(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9148


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      400.000 to Point/Station      420.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1850.000(Ft.)
Bottom (of initial area) elevation =  1320.000(Ft.)
Difference in elevation =   530.000(Ft.)
Slope =    0.53000  s(%)=      53.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.447 min.
Rainfall intensity =      3.326(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.791
Subarea runoff =     24.990(CFS)
Total initial stream area =        9.500(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      420.000 to Point/Station      421.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     37.485(CFS)
Depth of flow =   0.883(Ft.), Average velocity =  12.826(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              20.00
      2            100.00               0.00
      3            150.00              20.00
```

```
Manning's 'N' friction factor =   0.035
-----------------------------------------------------------------
Sub-Channel flow  =     37.485(CFS)
  '     '    flow top width =      6.621(Ft.)
  '     '    velocity=   12.826(Ft/s)
  '     '    area =      2.923(Sq.Ft)
  '     '    Froude number =     3.402

Upstream point elevation =  1320.000(Ft.)
Downstream point elevation =  1140.000(Ft.)
Flow length =   630.000(Ft.)
Travel time  =    0.82 min.
Time of concentration =   10.27 min.
Depth of flow =   0.883(Ft.)
Average velocity =  12.826(Ft/s)
Total irregular channel flow =    37.485(CFS)
Irregular channel normal depth above invert elev. =   0.883(Ft.)
Average velocity of channel(s) =  12.826(Ft/s)

Sub-Channel No. 1 Critical depth =      1.438(Ft.)
  '     '       '     Critical flow top width =     10.781(Ft.)
  '     '       '     Critical flow velocity=    4.837(Ft/s)
  '     '       '     Critical flow area =      7.749(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      3.165(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.785
Subarea runoff =     22.224(CFS) for    9.500(Ac.)
Total runoff =     47.214(CFS)
Effective area this stream =       19.00(Ac.)
Total Study Area (Main Stream No. 1) =       86.50(Ac.)
Area averaged Fm value =    0.404(In/Hr)


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Process from Point/Station      421.000 to Point/Station      422.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
-----------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     63.366(CFS)
Depth of flow =   1.089(Ft.), Average velocity =   8.545(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              20.00
      2            100.00               0.00
      3            250.00              20.00
Manning's 'N' friction factor =   0.035
-----------------------------------------------------------------
Sub-Channel flow  =     63.366(CFS)
  '     '    flow top width =     13.616(Ft.)
  '     '    velocity=    8.545(Ft/s)
  '     '    area =      7.416(Sq.Ft)
```

' ' Froude number = 2.040

Upstream point elevation = 1140.000(Ft.)
Downstream point elevation = 1064.000(Ft.)
Flow length = 820.000(Ft.)
Travel time = 1.60 min.
Time of concentration = 11.87 min.
Depth of flow = 1.089(Ft.)
Average velocity = 8.545(Ft/s)
Total irregular channel flow = 63.366(CFS)
Irregular channel normal depth above invert elev. = 1.089(Ft.)
Average velocity of channel(s) = 8.545(Ft/s)

Sub-Channel No. 1 Critical depth = 1.453(Ft.)
' ' ' Critical flow top width = 18.164(Ft.)
' ' ' Critical flow velocity= 4.801(Ft/s)
' ' ' Critical flow area = 13.197(Sq.Ft)

Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 78.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.404(In/Hr)
Rainfall intensity = 2.901(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area,(total area with modified rational method)(Q=KCIA) is C = 0.775
Subarea runoff = 24.721(CFS) for 13.000(Ac.)
Total runoff = 71.935(CFS)
Effective area this stream = 32.00(Ac.)
Total Study Area (Main Stream No. 1) = 99.50(Ac.)
Area averaged Fm value = 0.404(In/Hr)

++
Process from Point/Station 422.000 to Point/Station 422.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 32.000(Ac.)
Runoff from this stream = 71.935(CFS)
Time of concentration = 11.87 min.
Rainfall intensity = 2.901(In/Hr)
Area averaged loss rate (Fm) = 0.4035(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	149.893	13.30	2.709
2	71.935	11.87	2.901

Qmax(1) =
1.000 * 1.000 * 149.893) +
0.923 * 1.000 * 71.935) + = 216.282

Qmax(2) =
1.083 * 0.892 * 149.893) +
1.000 * 1.000 * 71.935) + = 216.754

```
Total of 2 streams to confluence:
Flow rates before confluence point:
     149.893      71.935
Maximum flow rates at confluence using above data:
      216.282      216.754
Area of streams before confluence:
       67.500       32.000
Effective area values after confluence:
       99.500       92.201
Results of confluence:
Total flow rate =    216.754(CFS)
Time of concentration =    11.865 min.
Effective stream area after confluence =     92.201(Ac.)
Stream Area average Pervious fraction(Ap) =  0.942
Stream Area average soil loss rate(Fm) =    0.399(In/Hr)
Study area (this main stream) =      99.50(Ac.)


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Process from Point/Station       79.000 to Point/Station       80.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1052.000(Ft.)
Downstream point/station elevation =  1040.200(Ft.)
Pipe length  =   440.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   216.754(CFS)
Given pipe size =     54.00(In.)
Calculated individual pipe flow  =   216.754(CFS)
Normal flow depth in pipe =   32.44(In.)
Flow top width inside pipe =   52.89(In.)
Critical Depth =   49.65(In.)
Pipe flow velocity =     21.72(Ft/s)
Travel time through pipe =    0.34 min.
Time of concentration (TC) =    12.20 min.


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Process from Point/Station       80.000 to Point/Station       80.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     92.201(Ac.)
Runoff from this stream =    216.754(CFS)
Time of concentration =   12.20 min.
Rainfall intensity =     2.853(In/Hr)
Area averaged loss rate (Fm) =    0.3993(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9422


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Process from Point/Station      423.000 to Point/Station      424.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
```

```
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1102.500(Ft.)
Bottom (of initial area) elevation =  1060.500(Ft.)
Difference in elevation =    42.000(Ft.)
Slope =    0.04200  s(%)=       4.20
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.623 min.
Rainfall intensity =      2.937(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.788
Subarea runoff =     20.821(CFS)
Total initial stream area =        9.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.367(In/Hr)


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Process from Point/Station      424.000 to Point/Station      425.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1060.500(Ft.)
End of street segment elevation =  1049.000(Ft.)
Length of street segment  =   800.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     38.172(CFS)
Depth of flow =   0.514(Ft.), Average velocity =   4.288(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 =   4.29(Ft/s)
Travel time =    3.11 min.     TC =   14.73  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Rainfall intensity =      2.548(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.770
Subarea runoff =     26.288(CFS) for   15.000(Ac.)
Total runoff =     47.109(CFS)
Effective area this stream =       24.00(Ac.)
Total Study Area (Main Stream No. 1) =      123.50(Ac.)
Area averaged Fm value =    0.367(In/Hr)
Street flow at end of street =     47.109(CFS)
Half street flow at end of street =     23.555(CFS)
```

```
Depth of flow =   0.544(Ft.), Average velocity =   4.661(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      425.000 to Point/Station      425.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     24.000(Ac.)
Runoff from this stream =     47.109(CFS)
Time of concentration =   14.73 min.
Rainfall intensity =     2.548(In/Hr)
Area averaged loss rate (Fm) =    0.3670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

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


1       216.754     12.20                2.853
2        47.109     14.73                2.548
Qmax(1) =
          1.000 *    1.000 *   216.754) +
          1.140 *    0.828 *    47.109) + =     261.229
Qmax(2) =
          0.876 *    1.000 *   216.754) +
          1.000 *    1.000 *    47.109) + =     236.929

Total of 2 streams to confluence:
Flow rates before confluence point:
     216.754      47.109
Maximum flow rates at confluence using above data:
      261.229      236.929
Area of streams before confluence:
       92.201       24.000
Effective area values after confluence:
      112.080      116.201
Results of confluence:
Total flow rate =    261.229(CFS)
Time of concentration =    12.203 min.
Effective stream area after confluence =    112.080(Ac.)
Stream Area average Pervious fraction(Ap) =  0.851
Stream Area average soil loss rate(Fm) =    0.393(In/Hr)
Study area (this main stream) =     116.20(Ac.)
End of computations, Total Study Area =          123.50 (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) = 0.856
Area averaged SCS curve number =  71.7
```

LINE "P2"

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
Rational Hydrology Study Date: 01/13/05

FONTANA / LINE P2 HYDROLOGY
25 YEAR STORM
JN 04339

Hall & Forman, Inc. - S/N 950

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

Rational hydrology study storm event year is 25.0
10 Year storm 1 hour rainfall = 0.930(In.)
100 Year storm 1 hour rainfall = 1.350(In.)
Computed rainfall intensity:
Storm year = 25.00 1 hour rainfall = 1.097 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

++
Process from Point/Station 500.000 to Point/Station 501.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 78.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.404(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 1620.000(Ft.)
Bottom (of initial area) elevation = 1350.000(Ft.)
Difference in elevation = 270.000(Ft.)
Slope = 0.27000 s(%)= 27.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.812 min.
Rainfall intensity = 3.068(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.782
Subarea runoff = 14.387(CFS)
Total initial stream area = 6.000(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.404(In/Hr)

++
Process from Point/Station 501.000 to Point/Station 502.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 25.177(CFS)
Depth of flow = 0.658(Ft.), Average velocity = 11.641(Ft/s)
******* Irregular Channel Data **********

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              20.00
      2            100.00               0.00
      3            200.00              20.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =     25.177(CFS)
  '     '    flow top width =      6.577(Ft.)
  '     '    velocity=   11.641(Ft/s)
  '     '    area =      2.163(Sq.Ft)
  '     '    Froude number =     3.578

Upstream point elevation =  1350.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
Flow length =   500.000(Ft.)
Travel time  =    0.72 min.
Time of concentration =   11.53 min.
Depth of flow =   0.658(Ft.)
Average velocity =  11.641(Ft/s)
Total irregular channel flow =    25.177(CFS)
Irregular channel normal depth above invert elev. =   0.658(Ft.)
Average velocity of channel(s) =  11.641(Ft/s)

Sub-Channel No. 1 Critical depth =      1.094(Ft.)
  '     '       '     Critical flow top width =     10.938(Ft.)
  '     '       '     Critical flow velocity=    4.209(Ft/s)
  '     '       '     Critical flow area =      5.981(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      2.952(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.777
Subarea runoff =     20.017(CFS) for    9.000(Ac.)
Total runoff =     34.404(CFS)
Effective area this stream =       15.00(Ac.)
Total Study Area (Main Stream No. 1) =       15.00(Ac.)
Area averaged Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      502.000 to Point/Station       83.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1167.600(Ft.)
Downstream point/station elevation =  1126.000(Ft.)
Pipe length  =   660.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    34.404(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =    34.404(CFS)
Normal flow depth in pipe =   13.48(In.)
Flow top width inside pipe =   23.82(In.)
Critical depth could not be calculated.
```

```
Pipe flow velocity =     18.94(Ft/s)
Travel time through pipe =    0.58 min.
Time of concentration (TC) =    12.11 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       83.000 to Point/Station       83.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     15.000(Ac.)
Runoff from this stream =     34.404(CFS)
Time of concentration =   12.11 min.
Rainfall intensity =     2.866(In/Hr)
Area averaged loss rate (Fm) =    0.4035(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      503.000 to Point/Station      504.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1520.000(Ft.)
Bottom (of initial area) elevation =  1180.000(Ft.)
Difference in elevation =   340.000(Ft.)
Slope =    0.34000  s(%)=      34.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.324 min.
Rainfall intensity =      3.154(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.785
Subarea runoff =     24.752(CFS)
Total initial stream area =       10.000(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      504.000 to Point/Station      505.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
Top of street segment elevation =  1167.600(Ft.)
End of street segment elevation =  1126.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     27.228(CFS)
Depth of flow =   0.374(Ft.), Average velocity =   6.735(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  13.965(Ft.)
Flow velocity =   6.73(Ft/s)
Travel time =    1.63 min.     TC =   11.96  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Rainfall intensity =      2.888(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.776
Subarea runoff =      2.143(CFS) for    2.000(Ac.)
Total runoff =     26.896(CFS)
Effective area this stream =       12.00(Ac.)
Total Study Area (Main Stream No. 1) =       27.00(Ac.)
Area averaged Fm value =    0.397(In/Hr)
Street flow at end of street =     26.896(CFS)
Half street flow at end of street =     13.448(CFS)
Depth of flow =   0.373(Ft.), Average velocity =   6.714(Ft/s)
Flow width (from curb towards crown)=  13.898(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      505.000 to Point/Station      505.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     12.000(Ac.)
Runoff from this stream =     26.896(CFS)
Time of concentration =   11.96 min.
Rainfall intensity =     2.888(In/Hr)
Area averaged loss rate (Fm) =    0.3974(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9167
Summary of stream data:

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


1        34.404     12.11                2.866
2        26.896     11.96                2.888
Qmax(1) =
          1.000 *    1.000 *    34.404) +
          0.991 *    1.000 *    26.896) + =      61.067
Qmax(2) =
          1.009 *    0.988 *    34.404) +
          1.000 *    1.000 *    26.896) + =      61.170

Total of 2 streams to confluence:
Flow rates before confluence point:
      34.404      26.896
```

```
Maximum flow rates at confluence using above data:
       61.067       61.170
Area of streams before confluence:
       15.000       12.000
Effective area values after confluence:
       27.000       26.814
Results of confluence:
Total flow rate =     61.170(CFS)
Time of concentration =    11.958 min.
Effective stream area after confluence =     26.814(Ac.)
Stream Area average Pervious fraction(Ap) =  0.963
Stream Area average soil loss rate(Fm) =    0.401(In/Hr)
Study area (this main stream) =      27.00(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       83.000 to Point/Station       85.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1126.000(Ft.)
Downstream point/station elevation =  1092.300(Ft.)
Pipe length  =   450.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    61.170(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =    61.170(CFS)
Normal flow depth in pipe =   14.36(In.)
Flow top width inside pipe =   35.25(In.)
Critical Depth =   30.26(In.)
Pipe flow velocity =     23.26(Ft/s)
Travel time through pipe =    0.32 min.
Time of concentration (TC) =    12.28 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       85.000 to Point/Station       85.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Effective stream flow area =     26.814(Ac.)
Total study area this main stream =     27.000(Ac.)
Runoff from this stream =     61.170(CFS)
Time of concentration =   12.28 min.
Rainfall intensity =     2.842(In/Hr)
Area averaged loss rate (Fm) =    0.4008(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9630
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      506.000 to Point/Station      507.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
```

```
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  2040.000(Ft.)
Bottom (of initial area) elevation =  1680.000(Ft.)
Difference in elevation =   360.000(Ft.)
Slope =    0.36000  s(%)=      36.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.207 min.
Rainfall intensity =      3.175(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.786
Subarea runoff =     19.958(CFS)
Total initial stream area =        8.000(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      507.000 to Point/Station      508.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     34.927(CFS)
Depth of flow =   0.950(Ft.), Average velocity =  15.488(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              20.00
      2             50.00               0.00
      3            100.00              20.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------------
Sub-Channel flow  =     34.927(CFS)
  '     '    flow top width =      4.749(Ft.)
  '     '    velocity=   15.488(Ft/s)
  '     '    area =      2.255(Sq.Ft)
  '     '    Froude number =     3.961

Upstream point elevation =  1680.000(Ft.)
Downstream point elevation =  1450.000(Ft.)
Flow length =   580.000(Ft.)
Travel time  =    0.62 min.
Time of concentration =   10.83 min.
Depth of flow =   0.950(Ft.)
Average velocity =  15.488(Ft/s)
Total irregular channel flow =    34.927(CFS)
Irregular channel normal depth above invert elev. =   0.950(Ft.)
Average velocity of channel(s) =  15.488(Ft/s)

Sub-Channel No. 1 Critical depth =      1.641(Ft.)
  '     '       '     Critical flow top width =      8.203(Ft.)
  '     '       '     Critical flow velocity=    5.190(Ft/s)
  '     '       '     Critical flow area =      6.729(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      3.064(In/Hr) for a    25.0 year storm
```

```
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.781
Subarea runoff =     27.938(CFS) for   12.000(Ac.)
Total runoff =     47.896(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 2) =       20.00(Ac.)
Area averaged Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      508.000 to Point/Station      509.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     80.825(CFS)
Depth of flow =   1.362(Ft.), Average velocity =  17.418(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              20.00
      2             50.00               0.00
      3            100.00              20.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------------
Sub-Channel flow  =     80.825(CFS)
  '     '    flow top width =      6.812(Ft.)
  '     '    velocity=   17.418(Ft/s)
  '     '    area =      4.640(Sq.Ft)
  '     '    Froude number =     3.719

Upstream point elevation =  1450.000(Ft.)
Downstream point elevation =  1140.000(Ft.)
Flow length =  1000.000(Ft.)
Travel time  =    0.96 min.
Time of concentration =   11.79 min.
Depth of flow =   1.362(Ft.)
Average velocity =  17.418(Ft/s)
Total irregular channel flow =    80.825(CFS)
Irregular channel normal depth above invert elev. =   1.362(Ft.)
Average velocity of channel(s) =  17.418(Ft/s)

Sub-Channel No. 1 Critical depth =      2.313(Ft.)
  '     '       '     Critical flow top width =     11.563(Ft.)
  '     '       '     Critical flow velocity=    6.046(Ft/s)
  '     '       '     Critical flow area =     13.369(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      2.913(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.775
Subarea runoff =     59.369(CFS) for   27.500(Ac.)
Total runoff =    107.265(CFS)
Effective area this stream =       47.50(Ac.)
Total Study Area (Main Stream No. 2) =       47.50(Ac.)
```

```
Area averaged Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      509.000 to Point/Station      509.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     47.500(Ac.)
Runoff from this stream =    107.265(CFS)
Time of concentration =   11.79 min.
Rainfall intensity =     2.913(In/Hr)
Area averaged loss rate (Fm) =    0.4035(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      510.000 to Point/Station      511.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1560.000(Ft.)
Bottom (of initial area) elevation =  1180.000(Ft.)
Difference in elevation =   380.000(Ft.)
Slope =    0.38000  s(%)=      38.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.097 min.
Rainfall intensity =      3.196(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.786
Subarea runoff =     23.877(CFS)
Total initial stream area =        9.500(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      511.000 to Point/Station      512.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------------
Upstream point elevation =  1180.000(Ft.)
Downstream point elevation =  1140.000(Ft.)
Channel length thru subarea  =   530.000(Ft.)
Channel base width      =    0.000(Ft.)
Slope or 'Z' of left channel bank =   1.500
Slope or 'Z' of right channel bank =   1.500
Estimated mean flow rate at midpoint of channel =     54.666(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =     54.666(CFS)
Depth of flow =   1.389(Ft.), Average velocity =  18.883(Ft/s)
Channel flow top width =    4.168(Ft.)
Flow Velocity =   18.88(Ft/s)
Travel time  =    0.47 min.
```

```
Time of concentration =   10.57 min.
Critical depth =      2.375(Ft.)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      3.110(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.783
Subarea runoff =     58.956(CFS) for   24.500(Ac.)
Total runoff =     82.833(CFS)
Effective area this stream =       34.00(Ac.)
Total Study Area (Main Stream No. 2) =       81.50(Ac.)
Area averaged Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      512.000 to Point/Station      512.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     34.000(Ac.)
Runoff from this stream =     82.833(CFS)
Time of concentration =   10.57 min.
Rainfall intensity =     3.110(In/Hr)
Area averaged loss rate (Fm) =    0.4035(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

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


1       107.265      11.79                2.913
2        82.833      10.57                3.110
Qmax(1) =
          1.000 *     1.000 *   107.265) +
          0.927 *     1.000 *    82.833) + =     184.044
Qmax(2) =
          1.079 *     0.896 *   107.265) +
          1.000 *     1.000 *    82.833) + =     186.550

Total of 2 streams to confluence:
Flow rates before confluence point:
     107.265      82.833
Maximum flow rates at confluence using above data:
      184.044      186.550
Area of streams before confluence:
       47.500       34.000
Effective area values after confluence:
       81.500       76.572
Results of confluence:
Total flow rate =    186.550(CFS)
Time of concentration =    10.565 min.
Effective stream area after confluence =     76.572(Ac.)
Stream Area average Pervious fraction(Ap) =  1.000
Stream Area average soil loss rate(Fm) =    0.404(In/Hr)
```

```
Study area (this main stream) =      81.50(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      512.000 to Point/Station       84.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1137.500(Ft.)
Downstream point/station elevation =  1110.000(Ft.)
Pipe length  =   450.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   186.550(CFS)
Given pipe size =     30.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    99.193(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     93.053(Ft.)
 Minor friction loss =     33.640(Ft.)    K-factor =   1.50
Pipe flow velocity =     38.00(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =    10.76 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       84.000 to Point/Station       84.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     76.572(Ac.)
Runoff from this stream =    186.550(CFS)
Time of concentration =   10.76 min.
Rainfall intensity =     3.076(In/Hr)
Area averaged loss rate (Fm) =    0.4035(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      513.000 to Point/Station      514.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1770.000(Ft.)
Bottom (of initial area) elevation =  1460.000(Ft.)
Difference in elevation =   310.000(Ft.)
Slope =    0.31000  s(%)=      31.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.517 min.
Rainfall intensity =      3.119(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.784
Subarea runoff =     17.108(CFS)
Total initial stream area =        7.000(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      514.000 to Point/Station      515.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     25.662(CFS)
Depth of flow =   0.584(Ft.), Average velocity =  10.023(Ft/s)
      ******* Irregular Channel Data **********
------------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              20.00
      2            150.00               0.00
      3            300.00              20.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------------------
Sub-Channel flow  =     25.662(CFS)
  '     '    flow top width =      8.764(Ft.)
  '     '    velocity=   10.023(Ft/s)
  '     '    area =      2.560(Sq.Ft)
  '     '    Froude number =     3.268

Upstream point elevation =  1460.000(Ft.)
Downstream point elevation =  1140.000(Ft.)
Flow length =  1100.000(Ft.)
Travel time  =    1.83 min.
Time of concentration =   12.35 min.
Depth of flow =   0.584(Ft.)
Average velocity =  10.023(Ft/s)
Total irregular channel flow =    25.662(CFS)
Irregular channel normal depth above invert elev. =   0.584(Ft.)
Average velocity of channel(s) =  10.023(Ft/s)

Sub-Channel No. 1 Critical depth =      0.938(Ft.)
  '     '       '     Critical flow top width =     14.063(Ft.)
  '     '       '     Critical flow velocity=    3.893(Ft/s)
  '     '       '     Critical flow area =      6.592(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      2.833(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.772
Subarea runoff =     13.503(CFS) for    7.000(Ac.)
Total runoff =     30.611(CFS)
Effective area this stream =       14.00(Ac.)
Total Study Area (Main Stream No. 2) =       95.50(Ac.)
Area averaged Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      515.000 to Point/Station       84.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1119.100(Ft.)
```

```
Downstream point/station elevation =  1111.400(Ft.)
Pipe length  =   280.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    30.611(CFS)
Given pipe size =     18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    23.058(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     23.769(Ft.)
 Minor friction loss =      6.989(Ft.)    K-factor =   1.50
Pipe flow velocity =     17.32(Ft/s)
Travel time through pipe =    0.27 min.
Time of concentration (TC) =    12.62 min.


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Process from Point/Station       84.000 to Point/Station       84.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     14.000(Ac.)
Runoff from this stream =     30.611(CFS)
Time of concentration =   12.62 min.
Rainfall intensity =     2.796(In/Hr)
Area averaged loss rate (Fm) =    0.4035(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

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


1      186.550     10.76               3.076
2       30.611     12.62               2.796
Qmax(1) =
         1.000 *    1.000 *   186.550) +
         1.117 *    0.853 *    30.611) + =     215.717
Qmax(2) =
         0.895 *    1.000 *   186.550) +
         1.000 *    1.000 *    30.611) + =     197.640

Total of 2 streams to confluence:
Flow rates before confluence point:
     186.550      30.611
Maximum flow rates at confluence using above data:
      215.717      197.640
Area of streams before confluence:
       76.572       14.000
Effective area values after confluence:
       88.515       90.572
Results of confluence:
Total flow rate =    215.717(CFS)
Time of concentration =    10.762 min.
Effective stream area after confluence =     88.515(Ac.)
Stream Area average Pervious fraction(Ap) =  1.000
Stream Area average soil loss rate(Fm) =    0.404(In/Hr)
Study area (this main stream) =      90.57(Ac.)


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Process from Point/Station       84.000 to Point/Station       85.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
```

```
Upstream point/station elevation =  1110.700(Ft.)
Downstream point/station elevation =  1092.300(Ft.)
Pipe length  =   600.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   215.717(CFS)
Given pipe size =     30.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
   192.481(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =    165.899(Ft.)
 Minor friction loss =     44.981(Ft.)    K-factor =   1.50
Pipe flow velocity =     43.95(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =    10.99 min.


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Process from Point/Station       85.000 to Point/Station       85.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Effective stream flow area =     88.515(Ac.)
Total study area this main stream =     95.500(Ac.)
Runoff from this stream =    215.717(CFS)
Time of concentration =   10.99 min.
Rainfall intensity =     3.038(In/Hr)
Area averaged loss rate (Fm) =    0.4035(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Program is now starting with Main Stream No. 3


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Process from Point/Station      516.000 to Point/Station      517.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1148.000(Ft.)
Bottom (of initial area) elevation =  1101.000(Ft.)
Difference in elevation =    47.000(Ft.)
Slope =    0.04700  s(%)=       4.70
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.364 min.
Rainfall intensity =      2.977(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.789
Subarea runoff =     16.446(CFS)
Total initial stream area =        7.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.367(In/Hr)


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Process from Point/Station      517.000 to Point/Station      517.000
```

**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 3
Effective stream flow area = 7.000(Ac.)
Total study area this main stream = 7.000(Ac.)
Runoff from this stream = 16.446(CFS)
Time of concentration = 11.36 min.
Rainfall intensity = 2.977(In/Hr)
Area averaged loss rate (Fm) = 0.3670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	61.170	12.28	2.842
2	215.717	10.99	3.038
3	16.446	11.36	2.977

```
Qmax(1) =
          1.000 *    1.000 *    61.170) +
          0.926 *    1.000 *   215.717) +
          0.948 *    1.000 *    16.446) + =     276.451
Qmax(2) =
          1.080 *    0.895 *    61.170) +
          1.000 *    1.000 *   215.717) +
          1.023 *    0.967 *    16.446) + =     291.121
Qmax(3) =
          1.055 *    0.925 *    61.170) +
          0.977 *    1.000 *   215.717) +
          1.000 *    1.000 *    16.446) + =     286.961
```

Total of 3 main streams to confluence:
Flow rates before confluence point:
62.170 216.717 17.446
Maximum flow rates at confluence using above data:
276.451 291.121 286.961
Effective Area of streams before confluence:
26.814 88.515 7.000
Effective area values after confluence:
122.329 119.281 120.329

Results of confluence:
Total flow rate = 291.121(CFS)
Time of concentration = 10.990 min.
Effective stream area after confluence = 119.281(Ac.)
Stream Area average Pervious fraction(Ap) = 0.963
Stream Area average soil loss rate(Fm) = 0.401(In/Hr)
Steam effective area = 122.33(Ac.)

++
Process from Point/Station 85.000 to Point/Station 86.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1092.300(Ft.)
Downstream point/station elevation = 1059.300(Ft.)
Pipe length = 950.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 291.121(CFS)

```
Given pipe size =     39.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
   113.743(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =    118.059(Ft.)
 Minor friction loss =     28.684(Ft.)    K-factor =   1.50
Pipe flow velocity =     35.09(Ft/s)
Travel time through pipe =    0.45 min.
Time of concentration (TC) =    11.44 min.


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Process from Point/Station       86.000 to Point/Station       86.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    119.281(Ac.)
Runoff from this stream =    291.121(CFS)
Time of concentration =   11.44 min.
Rainfall intensity =     2.965(In/Hr)
Area averaged loss rate (Fm) =    0.4008(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9633


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Process from Point/Station      518.000 to Point/Station      519.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1148.000(Ft.)
Bottom (of initial area) elevation =  1101.000(Ft.)
Difference in elevation =    47.000(Ft.)
Slope =    0.04700  s(%)=       4.70
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.364 min.
Rainfall intensity =      2.977(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.789
Subarea runoff =     19.970(CFS)
Total initial stream area =        8.500(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.367(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      519.000 to Point/Station      520.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1101.000(Ft.)
End of street segment elevation =  1066.500(Ft.)
Length of street segment  =   900.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     29.954(CFS)
Depth of flow =   0.414(Ft.), Average velocity =   5.714(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  15.968(Ft.)
Flow velocity =   5.71(Ft/s)
Travel time =    2.62 min.     TC =   13.99  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Rainfall intensity =      2.628(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.774
Subarea runoff =     14.629(CFS) for    8.500(Ac.)
Total runoff =     34.599(CFS)
Effective area this stream =       17.00(Ac.)
Total Study Area (Main Stream No. 1) =       24.00(Ac.)
Area averaged Fm value =    0.367(In/Hr)
Street flow at end of street =     34.599(CFS)
Half street flow at end of street =     17.299(CFS)
Depth of flow =   0.433(Ft.), Average velocity =   5.921(Ft/s)
Flow width (from curb towards crown)=  16.884(Ft.)


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Process from Point/Station      520.000 to Point/Station      520.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     17.000(Ac.)
Runoff from this stream =     34.599(CFS)
Time of concentration =   13.99 min.
Rainfall intensity =     2.628(In/Hr)
Area averaged loss rate (Fm) =    0.3670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000


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Process from Point/Station      521.000 to Point/Station      522.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
```

```
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1111.000(Ft.)
Bottom (of initial area) elevation =  1101.000(Ft.)
Difference in elevation =    10.000(Ft.)
Slope =    0.01000  s(%)=       1.00
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   15.486 min.
Rainfall intensity =      2.473(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.766
Subarea runoff =     10.424(CFS)
Total initial stream area =        5.500(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.367(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      522.000 to Point/Station      523.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1101.000(Ft.)
End of street segment elevation =  1066.500(Ft.)
Length of street segment  =   900.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     26.533(CFS)
Depth of flow =   0.400(Ft.), Average velocity =   5.547(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  15.233(Ft.)
Flow velocity =   5.55(Ft/s)
Travel time =    2.70 min.     TC =   18.19  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Rainfall intensity =      2.245(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.753
Subarea runoff =     27.609(CFS) for   17.000(Ac.)
Total runoff =     38.033(CFS)
Effective area this stream =       22.50(Ac.)
Total Study Area (Main Stream No. 1) =       46.50(Ac.)
Area averaged Fm value =    0.367(In/Hr)
Street flow at end of street =     38.033(CFS)
Half street flow at end of street =     19.016(CFS)
```

```
Depth of flow =   0.445(Ft.), Average velocity =   6.060(Ft/s)
Flow width (from curb towards crown)=  17.511(Ft.)


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Process from Point/Station      523.000 to Point/Station      523.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =     22.500(Ac.)
Runoff from this stream =     38.033(CFS)
Time of concentration =   18.19 min.
Rainfall intensity =     2.245(In/Hr)
Area averaged loss rate (Fm) =    0.3670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

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


1       291.121      11.44                2.965
2        34.599      13.99                2.628
3        38.033      18.19                2.245
Qmax(1) =
          1.000 *     1.000 *   291.121) +
          1.149 *     0.818 *    34.599) +
          1.383 *     0.629 *    38.033) + =      356.728
Qmax(2) =
          0.869 *     1.000 *   291.121) +
          1.000 *     1.000 *    34.599) +
          1.204 *     0.769 *    38.033) + =      322.681
Qmax(3) =
          0.719 *     1.000 *   291.121) +
          0.831 *     1.000 *    34.599) +
          1.000 *     1.000 *    38.033) + =      276.134

Total of 3 streams to confluence:
Flow rates before confluence point:
     291.121       34.599       38.033
Maximum flow rates at confluence using above data:
      356.728       322.681       276.134
Area of streams before confluence:
      119.281        17.000        22.500
Effective area values after confluence:
      147.337       153.584       158.781
Results of confluence:
Total flow rate =     356.728(CFS)
Time of concentration =    11.441 min.
Effective stream area after confluence =     147.337(Ac.)
Stream Area average Pervious fraction(Ap) =  0.848
Stream Area average soil loss rate(Fm) =    0.392(In/Hr)
Study area (this main stream) =     158.78(Ac.)


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Process from Point/Station       86.000 to Point/Station       87.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1059.300(Ft.)
Downstream point/station elevation =  1053.200(Ft.)
```

```
Pipe length  =   445.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   356.728(CFS)
Given pipe size =     48.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    40.106(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     27.436(Ft.)
 Minor friction loss =     18.770(Ft.)    K-factor =   1.50
Pipe flow velocity =     28.39(Ft/s)
Travel time through pipe =    0.26 min.
Time of concentration (TC) =    11.70 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       87.000 to Point/Station       87.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    147.337(Ac.)
Runoff from this stream =    356.728(CFS)
Time of concentration =   11.70 min.
Rainfall intensity =     2.925(In/Hr)
Area averaged loss rate (Fm) =    0.3924(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8480


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      524.000 to Point/Station      525.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =   750.000(Ft.)
Top (of initial area) elevation =  1072.300(Ft.)
Bottom (of initial area) elevation =  1065.000(Ft.)
Difference in elevation =     7.300(Ft.)
Slope =    0.00973  s(%)=       0.97
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   18.730 min.
Rainfall intensity =      2.206(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.735
Subarea runoff =     14.601(CFS)
Total initial stream area =        9.000(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      525.000 to Point/Station      525.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      9.000(Ac.)
Runoff from this stream =     14.601(CFS)
Time of concentration =   18.73 min.
```

```
Rainfall intensity =     2.206(In/Hr)
Area averaged loss rate (Fm) =    0.4035(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

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


1       356.728      11.70                2.925
2        14.601      18.73                2.206
Qmax(1) =
          1.000 *     1.000 *    356.728) +
          1.399 *     0.625 *     14.601) + =      369.491
Qmax(2) =
          0.716 *     1.000 *    356.728) +
          1.000 *     1.000 *     14.601) + =      270.033

Total of 2 streams to confluence:
Flow rates before confluence point:
     356.728      14.601
Maximum flow rates at confluence using above data:
      369.491      270.033
Area of streams before confluence:
      147.337        9.000
Effective area values after confluence:
      152.960      156.337
Results of confluence:
Total flow rate =    369.491(CFS)
Time of concentration =    11.702 min.
Effective stream area after confluence =    152.960(Ac.)
Stream Area average Pervious fraction(Ap) =  0.857
Stream Area average soil loss rate(Fm) =    0.393(In/Hr)
Study area (this main stream) =     156.34(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       87.000 to Point/Station       88.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1050.900(Ft.)
Downstream point/station elevation =  1033.600(Ft.)
Pipe length  =   370.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   369.491(CFS)
Given pipe size =     54.00(In.)
Calculated individual pipe flow  =   369.491(CFS)
Normal flow depth in pipe =   38.91(In.)
Flow top width inside pipe =   48.47(In.)
Critical depth could not be calculated.
Pipe flow velocity =     30.11(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =    11.91 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       88.000 to Point/Station       88.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    152.960(Ac.)
Runoff from this stream =    369.491(CFS)
```

```
Time of concentration =   11.91 min.
Rainfall intensity =     2.895(In/Hr)
Area averaged loss rate (Fm) =    0.3930(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8568


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      526.000 to Point/Station      527.000
**** INITIAL AREA EVALUATION ****

------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1065.000(Ft.)
Bottom (of initial area) elevation =  1060.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.275(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.755
Subarea runoff =     11.164(CFS)
Total initial stream area =        6.500(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.367(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      527.000 to Point/Station      527.000
**** CONFLUENCE OF MINOR STREAMS ****

------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      6.500(Ac.)
Runoff from this stream =     11.164(CFS)
Time of concentration =   17.79 min.
Rainfall intensity =     2.275(In/Hr)
Area averaged loss rate (Fm) =    0.3670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      528.000 to Point/Station      529.000
**** INITIAL AREA EVALUATION ****

------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1065.000(Ft.)
Bottom (of initial area) elevation =  1060.000(Ft.)
```

```
Difference in elevation =      5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.275(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.755
Subarea runoff =     11.164(CFS)
Total initial stream area =        6.500(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.367(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      529.000 to Point/Station      529.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      6.500(Ac.)
Runoff from this stream =     11.164(CFS)
Time of concentration =   17.79 min.
Rainfall intensity =     2.275(In/Hr)
Area averaged loss rate (Fm) =    0.3670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

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


1       369.491      11.91                2.895
2        11.164      17.79                2.275
3        11.164      17.79                2.275
Qmax(1) =
          1.000 *     1.000 *   369.491) +
          1.325 *     0.669 *    11.164) +
          1.325 *     0.669 *    11.164) + =      389.290
Qmax(2) =
          0.752 *     1.000 *   369.491) +
          1.000 *     1.000 *    11.164) +
          1.000 *     1.000 *    11.164) + =      300.304
Qmax(3) =
          0.752 *     1.000 *   369.491) +
          1.000 *     1.000 *    11.164) +
          1.000 *     1.000 *    11.164) + =      300.304

Total of 3 streams to confluence:
Flow rates before confluence point:
     369.491      11.164      11.164
Maximum flow rates at confluence using above data:
      389.290      300.304      300.304
Area of streams before confluence:
      152.960        6.500        6.500
Effective area values after confluence:
      161.661      165.960      165.960
Results of confluence:
Total flow rate =    389.290(CFS)
Time of concentration =    11.907 min.
Effective stream area after confluence =    161.661(Ac.)
Stream Area average Pervious fraction(Ap) =  0.829
Stream Area average soil loss rate(Fm) =    0.391(In/Hr)
Study area (this main stream) =     165.96(Ac.)
```

End of computations, Total Study Area = 191.00 (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) = 0.839
Area averaged SCS curve number = 70.9

LINE "P1"

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
Rational Hydrology Study Date: 01/13/05

FONTANA / LINE P1 HYDROLOGY
25 YEAR STORM
JN 04339

Hall & Forman, Inc. - S/N 950

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

Rational hydrology study storm event year is 25.0
10 Year storm 1 hour rainfall = 0.930(In.)
100 Year storm 1 hour rainfall = 1.350(In.)
Computed rainfall intensity:
Storm year = 25.00 1 hour rainfall = 1.097 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

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

UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 78.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.404(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 1850.000(Ft.)
Bottom (of initial area) elevation = 1300.000(Ft.)
Difference in elevation = 550.000(Ft.)
Slope = 0.55000 s(%)= 55.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.377 min.
Rainfall intensity = 3.341(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.791
Subarea runoff = 15.863(CFS)
Total initial stream area = 6.000(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.404(In/Hr)

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

Estimated mean flow rate at midpoint of channel = 28.422(CFS)
Depth of flow = 0.589(Ft.), Average velocity = 9.365(Ft/s)
******* Irregular Channel Data **********

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              20.00
      2            150.00               0.00
      3            350.00              20.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =     28.422(CFS)
  '     '    flow top width =     10.306(Ft.)
  '     '    velocity=    9.366(Ft/s)
  '     '    area =      3.035(Sq.Ft)
  '     '    Froude number =     3.042

Upstream point elevation =  1300.000(Ft.)
Downstream point elevation =  1087.000(Ft.)
Flow length =   850.000(Ft.)
Travel time  =    1.51 min.
Time of concentration =   10.89 min.
Depth of flow =   0.589(Ft.)
Average velocity =   9.365(Ft/s)
Total irregular channel flow =    28.422(CFS)
Irregular channel normal depth above invert elev. =   0.589(Ft.)
Average velocity of channel(s) =   9.365(Ft/s)

Sub-Channel No. 1 Critical depth =      0.922(Ft.)
  '     '       '     Critical flow top width =     16.133(Ft.)
  '     '       '     Critical flow velocity=    3.822(Ft/s)
  '     '       '     Critical flow area =      7.436(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      3.054(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.781
Subarea runoff =     21.117(CFS) for    9.500(Ac.)
Total runoff =     36.980(CFS)
Effective area this stream =       15.50(Ac.)
Total Study Area (Main Stream No. 1) =       15.50(Ac.)
Area averaged Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      402.000 to Point/Station       75.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1080.000(Ft.)
Downstream point/station elevation =  1077.000(Ft.)
Pipe length  =   550.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    36.980(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =    36.980(CFS)
Normal flow depth in pipe =   23.27(In.)
Flow top width inside pipe =   34.42(In.)
Critical Depth =   23.74(In.)
```

```
Pipe flow velocity =      7.65(Ft/s)
Travel time through pipe =    1.20 min.
Time of concentration (TC) =    12.09 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       75.000 to Point/Station       75.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Effective stream flow area =     15.500(Ac.)
Total study area this main stream =     15.500(Ac.)
Runoff from this stream =     36.980(CFS)
Time of concentration =   12.09 min.
Rainfall intensity =     2.869(In/Hr)
Area averaged loss rate (Fm) =    0.4035(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      403.000 to Point/Station      404.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1600.000(Ft.)
Bottom (of initial area) elevation =  1140.000(Ft.)
Difference in elevation =   460.000(Ft.)
Slope =    0.46000  s(%)=      46.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.719 min.
Rainfall intensity =      3.270(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.789
Subarea runoff =     14.191(CFS)
Total initial stream area =        5.500(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      404.000 to Point/Station      405.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
----------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     25.801(CFS)
Depth of flow =   0.623(Ft.), Average velocity =   6.651(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              20.00
      2            200.00               0.00
      3            400.00              20.00
```

```
Manning's 'N' friction factor =   0.035
-----------------------------------------------------------------
Sub-Channel flow  =     25.801(CFS)
   '      '    flow top width =     12.457(Ft.)
   '      '    velocity=    6.651(Ft/s)
   '      '    area =      3.879(Sq.Ft)
   '      '    Froude number =     2.100

Upstream point elevation =  1140.000(Ft.)
Downstream point elevation =  1085.000(Ft.)
Flow length =   470.000(Ft.)
Travel time  =    1.18 min.
Time of concentration =   10.90 min.
Depth of flow =   0.623(Ft.)
Average velocity =   6.651(Ft/s)
Total irregular channel flow =    25.801(CFS)
Irregular channel normal depth above invert elev. =   0.623(Ft.)
Average velocity of channel(s) =   6.651(Ft/s)

Sub-Channel No. 1 Critical depth =      0.836(Ft.)
   '      '       '     Critical flow top width =     16.719(Ft.)
   '      '       '     Critical flow velocity=    3.692(Ft/s)
   '      '       '     Critical flow area =      6.988(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      3.053(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.781
Subarea runoff =     20.390(CFS) for    9.000(Ac.)
Total runoff =     34.581(CFS)
Effective area this stream =       14.50(Ac.)
Total Study Area (Main Stream No. 2) =       14.50(Ac.)
Area averaged Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      405.000 to Point/Station       75.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
_________________________________________________________________________
Upstream point/station elevation =  1078.000(Ft.)
Downstream point/station elevation =  1077.000(Ft.)
Pipe length  =   150.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    34.581(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =    34.581(CFS)
Normal flow depth in pipe =   20.84(In.)
Flow top width inside pipe =   35.55(In.)
Critical Depth =   22.92(In.)
Pipe flow velocity =      8.16(Ft/s)
Travel time through pipe =    0.31 min.
Time of concentration (TC) =    11.20 min.


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

```
Process from Point/Station       75.000 to Point/Station       75.000
**** CONFLUENCE OF MAIN STREAMS ****
--------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Effective stream flow area =     14.500(Ac.)
Total study area this main stream =     14.500(Ac.)
Runoff from this stream =     34.581(CFS)
Time of concentration =   11.20 min.
Rainfall intensity =     3.003(In/Hr)
Area averaged loss rate (Fm) =    0.4035(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      406.000 to Point/Station      408.000
**** INITIAL AREA EVALUATION ****
--------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1065.000(Ft.)
Bottom (of initial area) elevation =  1055.000(Ft.)
Difference in elevation =    10.000(Ft.)
Slope =    0.01000  s(%)=       1.00
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   15.486 min.
Rainfall intensity =      2.473(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.766
Subarea runoff =     14.214(CFS)
Total initial stream area =        7.500(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.367(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      408.000 to Point/Station      408.000
**** CONFLUENCE OF MINOR STREAMS ****
--------------------------------------------------------------------------
Along Main Stream number: 3 in normal stream number 1
Stream flow area =      7.500(Ac.)
Runoff from this stream =     14.214(CFS)
Time of concentration =   15.49 min.
Rainfall intensity =     2.473(In/Hr)
Area averaged loss rate (Fm) =    0.3670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      407.000 to Point/Station      408.000
**** INITIAL AREA EVALUATION ****
--------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
```

```
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1065.000(Ft.)
Bottom (of initial area) elevation =  1055.000(Ft.)
Difference in elevation =    10.000(Ft.)
Slope =    0.01000  s(%)=       1.00
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   15.486 min.
Rainfall intensity =      2.473(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.766
Subarea runoff =     11.371(CFS)
Total initial stream area =        6.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.367(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      408.000 to Point/Station      408.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      6.000(Ac.)
Runoff from this stream =     11.371(CFS)
Time of concentration =   15.49 min.
Rainfall intensity =     2.473(In/Hr)
Area averaged loss rate (Fm) =    0.3670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

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


1        14.214      15.49                2.473
2        11.371      15.49                2.473
Qmax(1) =
          1.000 *     1.000 *     14.214) +
          1.000 *     1.000 *     11.371) + =       25.585
Qmax(2) =
          1.000 *     1.000 *     14.214) +
          1.000 *     1.000 *     11.371) + =       25.585

Total of 2 streams to confluence:
Flow rates before confluence point:
      14.214       11.371
Maximum flow rates at confluence using above data:
       25.585       25.585
Area of streams before confluence:
        7.500        6.000
Effective area values after confluence:
       13.500       13.500
Results of confluence:
Total flow rate =      25.585(CFS)
Time of concentration =    15.486 min.
Effective stream area after confluence =      13.500(Ac.)
Stream Area average Pervious fraction(Ap) =  0.500
```

Stream Area average soil loss rate(Fm) = 0.367(In/Hr)
Study area (this main stream) = 13.50(Ac.)

++
Process from Point/Station 408.000 to Point/Station 408.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 3
Effective stream flow area = 13.500(Ac.)
Total study area this main stream = 13.500(Ac.)
Runoff from this stream = 25.585(CFS)
Time of concentration = 15.49 min.
Rainfall intensity = 2.473(In/Hr)
Area averaged loss rate (Fm) = 0.3670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	36.980	12.09	2.869
2	34.581	11.20	3.003
3	25.585	15.49	2.473

Qmax(1) =
1.000 * 1.000 * 36.980) +
0.948 * 1.000 * 34.581) +
1.188 * 0.781 * 25.585) + = 93.508
Qmax(2) =
1.054 * 0.927 * 36.980) +
1.000 * 1.000 * 34.581) +
1.252 * 0.723 * 25.585) + = 93.883
Qmax(3) =
0.839 * 1.000 * 36.980) +
0.796 * 1.000 * 34.581) +
1.000 * 1.000 * 25.585) + = 84.149

Total of 3 main streams to confluence:
Flow rates before confluence point:
37.980 35.581 26.585
Maximum flow rates at confluence using above data:
93.508 93.883 84.149
Effective Area of streams before confluence:
15.500 14.500 13.500
Effective area values after confluence:
40.538 38.630 43.500

Results of confluence:
Total flow rate = 93.883(CFS)
Time of concentration = 11.203 min.
Effective stream area after confluence = 38.630(Ac.)
Stream Area average Pervious fraction(Ap) = 0.845
Stream Area average soil loss rate(Fm) = 0.392(In/Hr)
Steam effective area = 43.50(Ac.)

++
Process from Point/Station 75.000 to Point/Station 76.000

```
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1075.000(Ft.)
Downstream point/station elevation =  1047.000(Ft.)
Pipe length  =   550.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    93.883(CFS)
Given pipe size =     42.00(In.)
Calculated individual pipe flow  =    93.883(CFS)
Normal flow depth in pipe =   18.82(In.)
Flow top width inside pipe =   41.77(In.)
Critical Depth =   35.93(In.)
Pipe flow velocity =     22.47(Ft/s)
Travel time through pipe =    0.41 min.
Time of concentration (TC) =    11.61 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       76.000 to Point/Station       80.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1047.000(Ft.)
Downstream point/station elevation =  1041.300(Ft.)
Pipe length  =  1000.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    93.883(CFS)
Given pipe size =     54.00(In.)
Calculated individual pipe flow  =    93.883(CFS)
Normal flow depth in pipe =   31.17(In.)
Flow top width inside pipe =   53.35(In.)
Critical Depth =   34.13(In.)
Pipe flow velocity =      9.88(Ft/s)
Travel time through pipe =    1.69 min.
Time of concentration (TC) =    13.30 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       80.000 to Point/Station       80.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     38.630(Ac.)
Runoff from this stream =     93.883(CFS)
Time of concentration =   13.30 min.
Rainfall intensity =     2.709(In/Hr)
Area averaged loss rate (Fm) =    0.3922(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8448


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       80.000 to Point/Station       80.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 74.46
Pervious ratio(Ap) = 0.8510     Max loss rate(Fm)=     0.393(In/Hr)
Rainfall intensity =      2.853(In/Hr) for a    25.0 year storm
User specified values are as follows:
TC =  12.20 min.  Rain intensity =       2.85(In/Hr)
Total area this stream =       112.08(Ac.)
Total Study Area (Main Stream No. 1) =      125.58(Ac.)
Total runoff =    261.23(CFS)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       80.000 to Point/Station       80.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =    112.080(Ac.)
Runoff from this stream =    261.230(CFS)
Time of concentration =   12.20 min.
Rainfall intensity =     2.853(In/Hr)
Area averaged loss rate (Fm) =    0.3930(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8510
Summary of stream data:

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


1        93.883      13.30                2.709
2       261.230      12.20                2.853
Qmax(1) =
          1.000 *     1.000 *     93.883) +
          0.942 *     1.000 *    261.230) + =     339.845
Qmax(2) =
          1.062 *     0.917 *     93.883) +
          1.000 *     1.000 *    261.230) + =     352.705

Total of 2 streams to confluence:
Flow rates before confluence point:
      93.883     261.230
Maximum flow rates at confluence using above data:
      339.845      352.705
Area of streams before confluence:
       38.630      112.080
Effective area values after confluence:
      150.710      147.521
Results of confluence:
Total flow rate =    352.705(CFS)
Time of concentration =    12.200 min.
Effective stream area after confluence =    147.521(Ac.)
Stream Area average Pervious fraction(Ap) =  0.849
Stream Area average soil loss rate(Fm) =    0.393(In/Hr)
Study area (this main stream) =     150.71(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       80.000 to Point/Station       88.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1037.200(Ft.)
Downstream point/station elevation =  1031.600(Ft.)
Pipe length  =  1450.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   352.705(CFS)
Given pipe size =     90.00(In.)
Calculated individual pipe flow  =   352.705(CFS)
Normal flow depth in pipe =   57.56(In.)
Flow top width inside pipe =   86.42(In.)
Critical Depth =   58.29(In.)
Pipe flow velocity =     11.82(Ft/s)
Travel time through pipe =    2.04 min.
```

Time of concentration (TC) = 14.24 min.

++
Process from Point/Station 88.000 to Point/Station 88.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 147.521(Ac.)
Runoff from this stream = 352.705(CFS)
Time of concentration = 14.24 min.
Rainfall intensity = 2.600(In/Hr)
Area averaged loss rate (Fm) = 0.3928(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8494

++
Process from Point/Station 88.000 to Point/Station 88.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 73.85
Pervious ratio(Ap) = 0.8290 Max loss rate(Fm)= 0.391(In/Hr)
Rainfall intensity = 2.895(In/Hr) for a 25.0 year storm
User specified values are as follows:
TC = 11.91 min. Rain intensity = 2.89(In/Hr)
Total area this stream = 161.66(Ac.)
Total Study Area (Main Stream No. 1) = 287.24(Ac.)
Total runoff = 389.29(CFS)

++
Process from Point/Station 88.000 to Point/Station 88.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 161.660(Ac.)
Runoff from this stream = 389.290(CFS)
Time of concentration = 11.91 min.
Rainfall intensity = 2.895(In/Hr)
Area averaged loss rate (Fm) = 0.3910(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8290
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	352.705	14.24	2.600
2	389.290	11.91	2.895

Qmax(1) =
1.000 * 1.000 * 352.705) +
0.882 * 1.000 * 389.290) + = 696.160
Qmax(2) =
1.134 * 0.836 * 352.705) +
1.000 * 1.000 * 389.290) + = 723.574

Total of 2 streams to confluence:
Flow rates before confluence point:
352.705 389.290

```
Maximum flow rates at confluence using above data:
      696.160      723.574
Area of streams before confluence:
      147.521      161.660
Effective area values after confluence:
      309.181      285.002
Results of confluence:
Total flow rate =    723.574(CFS)
Time of concentration =    11.910 min.
Effective stream area after confluence =    285.002(Ac.)
Stream Area average Pervious fraction(Ap) =  0.839
Stream Area average soil loss rate(Fm) =    0.392(In/Hr)
Study area (this main stream) =     309.18(Ac.)


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Process from Point/Station       88.000 to Point/Station       89.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1031.100(Ft.)
Downstream point/station elevation =  1028.800(Ft.)
Pipe length  =   550.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   723.574(CFS)
Given pipe size =     96.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     5.987(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      3.460(Ft.)
 Minor friction loss =      4.826(Ft.)    K-factor =   1.50
Pipe flow velocity =     14.40(Ft/s)
Travel time through pipe =    0.64 min.
Time of concentration (TC) =    12.55 min.


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Process from Point/Station       89.000 to Point/Station       89.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    285.002(Ac.)
Runoff from this stream =    723.574(CFS)
Time of concentration =   12.55 min.
Rainfall intensity =     2.806(In/Hr)
Area averaged loss rate (Fm) =    0.3919(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8387


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      513.000 to Point/Station      530.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1770.000(Ft.)
```

```
Bottom (of initial area) elevation =  1380.000(Ft.)
Difference in elevation =   390.000(Ft.)
Slope =    0.39000  s(%)=      39.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.045 min.
Rainfall intensity =      3.206(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.787
Subarea runoff =     15.134(CFS)
Total initial stream area =        6.000(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      530.000 to Point/Station      531.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     23.962(CFS)
Depth of flow =   0.429(Ft.), Average velocity =   8.665(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              10.00
      2            150.00               0.00
      3            300.00              10.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------------------
Sub-Channel flow  =     23.962(CFS)
  '     '    flow top width =     12.881(Ft.)
  '     '    velocity=    8.665(Ft/s)
  '     '    area =      2.765(Sq.Ft)
  '     '    Froude number =     3.296

Upstream point elevation =  1380.000(Ft.)
Downstream point elevation =  1120.000(Ft.)
Flow length =   800.000(Ft.)
Travel time  =    1.54 min.
Time of concentration =   11.58 min.
Depth of flow =   0.429(Ft.)
Average velocity =   8.665(Ft/s)
Total irregular channel flow =    23.962(CFS)
Irregular channel normal depth above invert elev. =   0.429(Ft.)
Average velocity of channel(s) =   8.665(Ft/s)

Sub-Channel No. 1 Critical depth =      0.691(Ft.)
  '     '       '     Critical flow top width =     20.742(Ft.)
  '     '       '     Critical flow velocity=    3.342(Ft/s)
  '     '       '     Critical flow area =      7.171(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      2.943(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.777
```

```
Subarea runoff =     14.582(CFS) for    7.000(Ac.)
Total runoff =     29.716(CFS)
Effective area this stream =       13.00(Ac.)
Total Study Area (Main Stream No. 1) =      300.24(Ac.)
Area averaged Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      531.000 to Point/Station      532.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
Top of street segment elevation =  1120.000(Ft.)
End of street segment elevation =  1056.000(Ft.)
Length of street segment  =  1800.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     48.003(CFS)
Depth of flow =   0.484(Ft.), Average velocity =   6.240(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  19.430(Ft.)
Flow velocity =   6.24(Ft/s)
Travel time =    4.81 min.     TC =   16.39  min.
 Adding area flow to street
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      2.390(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.748
Subarea runoff =     22.129(CFS) for   16.000(Ac.)
Total runoff =     51.845(CFS)
Effective area this stream =       29.00(Ac.)
Total Study Area (Main Stream No. 1) =      316.24(Ac.)
Area averaged Fm value =    0.404(In/Hr)
Street flow at end of street =     51.845(CFS)
Half street flow at end of street =     25.923(CFS)
Depth of flow =   0.495(Ft.), Average velocity =   6.362(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      532.000 to Point/Station      532.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
```

```
Stream flow area =     29.000(Ac.)
Runoff from this stream =     51.845(CFS)
Time of concentration =   16.39 min.
Rainfall intensity =     2.390(In/Hr)
Area averaged loss rate (Fm) =    0.4035(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      533.000 to Point/Station      534.000
**** INITIAL AREA EVALUATION ****

------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1064.100(Ft.)
Bottom (of initial area) elevation =  1059.100(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.902 min.
Rainfall intensity =      2.638(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.875
Subarea runoff =     15.004(CFS)
Total initial stream area =        6.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.073(In/Hr)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      534.000 to Point/Station      535.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

------------------------------------------------------------------------
Top of street segment elevation =  1059.300(Ft.)
End of street segment elevation =  1056.200(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     21.352(CFS)
Depth of flow =   0.463(Ft.), Average velocity =   3.095(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  18.380(Ft.)
Flow velocity =   3.09(Ft/s)
Travel time =    1.78 min.     TC =   15.68  min.
```

```
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Rainfall intensity =      2.454(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.873
Subarea runoff =     10.712(CFS) for    5.500(Ac.)
Total runoff =     25.715(CFS)
Effective area this stream =       12.00(Ac.)
Total Study Area (Main Stream No. 1) =      328.24(Ac.)
Area averaged Fm value =    0.073(In/Hr)
Street flow at end of street =     25.715(CFS)
Half street flow at end of street =     12.858(CFS)
Depth of flow =   0.490(Ft.), Average velocity =   3.240(Ft/s)
Flow width (from curb towards crown)=  19.740(Ft.)


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Process from Point/Station      535.000 to Point/Station      535.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =     12.000(Ac.)
Runoff from this stream =     25.715(CFS)
Time of concentration =   15.68 min.
Rainfall intensity =     2.454(In/Hr)
Area averaged loss rate (Fm) =    0.0734(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

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


1       723.574      12.55                2.806
2        51.845      16.39                2.390
3        25.715      15.68                2.454
Qmax(1) =
          1.000 *     1.000 *   723.574) +
          1.209 *     0.765 *    51.845) +
          1.147 *     0.800 *    25.715) + =     795.178
Qmax(2) =
          0.828 *     1.000 *   723.574) +
          1.000 *     1.000 *    51.845) +
          0.973 *     1.000 *    25.715) + =     675.821
Qmax(3) =
          0.855 *     1.000 *   723.574) +
          1.032 *     0.957 *    51.845) +
          1.000 *     1.000 *    25.715) + =     695.223

Total of 3 streams to confluence:
Flow rates before confluence point:
     723.574       51.845       25.715
Maximum flow rates at confluence using above data:
      795.178       675.821       695.223
Area of streams before confluence:
```

```
      285.002       29.000       12.000
Effective area values after confluence:
      316.803      326.002      324.742
Results of confluence:
Total flow rate =    795.178(CFS)
Time of concentration =    12.547 min.
Effective stream area after confluence =    316.803(Ac.)
Stream Area average Pervious fraction(Ap) =  0.826
Stream Area average soil loss rate(Fm) =    0.381(In/Hr)
Study area (this main stream) =     326.00(Ac.)
End of computations, Total Study Area =          358.24 (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) = 0.827
Area averaged SCS curve number =  73.5
```

LINE "SIERRA AVE

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
Rational Hydrology Study Date: 01/13/05

FONTANA / LINE SIERRA AVENUE HYDROLOGY
25 YEAR STORM
JN 04339

Hall & Forman, Inc. - S/N 950

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

Rational hydrology study storm event year is 25.0
10 Year storm 1 hour rainfall = 0.930(In.)
100 Year storm 1 hour rainfall = 1.350(In.)
Computed rainfall intensity:
Storm year = 25.00 1 hour rainfall = 1.097 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

++
Process from Point/Station 200.000 to Point/Station 201.000
**** 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 = 1000.000(Ft.)
Top (of initial area) elevation = 1103.000(Ft.)
Bottom (of initial area) elevation = 1098.000(Ft.)
Difference in elevation = 5.000(Ft.)
Slope = 0.00500 s(%)= 0.50
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 13.902 min.
Rainfall intensity = 2.638(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.867
Subarea runoff = 12.575(CFS)
Total initial stream area = 5.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.098(In/Hr)

++
Process from Point/Station 201.000 to Point/Station 202.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1098.000(Ft.)
End of street segment elevation = 1091.600(Ft.)
Length of street segment = 670.000(Ft.)

```
Height of curb above gutter flowline  =    8.0(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 =     23.435(CFS)
Depth of flow =   0.475(Ft.), Average velocity =   3.187(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  18.988(Ft.)
Flow velocity =   3.19(Ft/s)
Travel time =    3.50 min.     TC =   17.41  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Rainfall intensity =      2.305(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.868
Subarea runoff =     17.435(CFS) for    9.500(Ac.)
Total runoff =     30.010(CFS)
Effective area this stream =       15.00(Ac.)
Total Study Area (Main Stream No. 1) =       15.00(Ac.)
Area averaged Fm value =    0.082(In/Hr)
Street flow at end of street =     30.010(CFS)
Half street flow at end of street =     15.005(CFS)
Depth of flow =   0.509(Ft.), Average velocity =   3.445(Ft/s)
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      202.000 to Point/Station       60.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1084.600(Ft.)
Downstream point/station elevation =  1078.400(Ft.)
Pipe length  =   555.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    30.010(CFS)
Given pipe size =     42.00(In.)
Calculated individual pipe flow  =    30.010(CFS)
Normal flow depth in pipe =   15.26(In.)
Flow top width inside pipe =   40.40(In.)
Critical Depth =   20.31(In.)
Pipe flow velocity =      9.50(Ft/s)
Travel time through pipe =    0.97 min.
Time of concentration (TC) =    18.38 min.


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Process from Point/Station       60.000 to Point/Station       60.000
**** CONFLUENCE OF MINOR STREAMS ****
--------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     15.000(Ac.)
Runoff from this stream =     30.010(CFS)
Time of concentration =   18.38 min.
Rainfall intensity =     2.231(In/Hr)
Area averaged loss rate (Fm) =    0.0823(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000

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Process from Point/Station      203.000 to Point/Station      204.000
**** 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 =  1000.000(Ft.)
Top (of initial area) elevation =  1103.000(Ft.)
Bottom (of initial area) elevation =  1096.000(Ft.)
Difference in elevation =     7.000(Ft.)
Slope =    0.00700  s(%)=       0.70
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.997 min.
Rainfall intensity =      2.747(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.868
Subarea runoff =     15.497(CFS)
Total initial stream area =        6.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)

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Process from Point/Station      204.000 to Point/Station      205.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
--------------------------------------------------------------------------------
Top of street segment elevation =  1096.000(Ft.)
End of street segment elevation =  1090.500(Ft.)
Length of street segment  =   675.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     25.630(CFS)
Depth of flow =   0.499(Ft.), Average velocity =   3.085(Ft/s)
```

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Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.08(Ft/s)
Travel time =    3.65 min.     TC =   16.64  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 =      2.368(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.863
Subarea runoff =     15.151(CFS) for    8.500(Ac.)
Total runoff =     30.648(CFS)
Effective area this stream =       15.00(Ac.)
Total Study Area (Main Stream No. 1) =       30.00(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Street flow at end of street =     30.648(CFS)
Half street flow at end of street =     15.324(CFS)
Depth of flow =   0.523(Ft.), Average velocity =   3.312(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      205.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     15.000(Ac.)
Runoff from this stream =     30.648(CFS)
Time of concentration =   16.64 min.
Rainfall intensity =     2.368(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      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1       30.010     18.38              2.231
2       30.648     16.64              2.368
Qmax(1) =
          1.000 *    1.000 *    30.010) +
          0.940 *    1.000 *    30.648) + =      58.812
Qmax(2) =
          1.064 *    0.906 *    30.010) +
          1.000 *    1.000 *    30.648) + =      59.555

Total of 2 streams to confluence:
Flow rates before confluence point:
      30.010      30.648
Maximum flow rates at confluence using above data:
       58.812      59.555
Area of streams before confluence:
       15.000      15.000
```

```
Effective area values after confluence:
      30.000       28.584
Results of confluence:
Total flow rate =     59.555(CFS)
Time of concentration =    16.645 min.
Effective stream area after confluence =     28.584(Ac.)
Stream Area average Pervious fraction(Ap) =  0.100
Stream Area average soil loss rate(Fm) =    0.090(In/Hr)
Study area (this main stream) =      30.00(Ac.)


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Process from Point/Station       60.000 to Point/Station       61.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1078.400(Ft.)
Downstream point/station elevation =  1076.700(Ft.)
Pipe length  =   500.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    59.555(CFS)
Given pipe size =     42.00(In.)
Calculated individual pipe flow  =    59.555(CFS)
Normal flow depth in pipe =   35.06(In.)
Flow top width inside pipe =   31.19(In.)
Critical Depth =   29.01(In.)
Pipe flow velocity =      6.95(Ft/s)
Travel time through pipe =    1.20 min.
Time of concentration (TC) =    17.84 min.


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Process from Point/Station       61.000 to Point/Station       61.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     28.584(Ac.)
Runoff from this stream =     59.555(CFS)
Time of concentration =   17.84 min.
Rainfall intensity =     2.271(In/Hr)
Area averaged loss rate (Fm) =    0.0901(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


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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 =  1000.000(Ft.)
Top (of initial area) elevation =  1103.000(Ft.)
Bottom (of initial area) elevation =  1097.000(Ft.)
Difference in elevation =     6.000(Ft.)
Slope =    0.00600  s(%)=       0.60
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.404 min.
```

```
Rainfall intensity =      2.697(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.867
Subarea runoff =     14.033(CFS)
Total initial stream area =        6.000(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
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1097.000(Ft.)
End of street segment elevation =  1089.300(Ft.)
Length of street segment  =   775.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     25.728(CFS)
Depth of flow =   0.486(Ft.), Average velocity =   3.310(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  19.533(Ft.)
Flow velocity =   3.31(Ft/s)
Travel time =    3.90 min.     TC =   17.31  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 =      2.313(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.862
Subarea runoff =     17.869(CFS) for   10.000(Ac.)
Total runoff =     31.903(CFS)
Effective area this stream =       16.00(Ac.)
Total Study Area (Main Stream No. 1) =       46.00(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Street flow at end of street =     31.903(CFS)
Half street flow at end of street =     15.951(CFS)
Depth of flow =   0.515(Ft.), Average velocity =   3.572(Ft/s)
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      208.000 to Point/Station      208.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
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Along Main Stream number: 1 in normal stream number 2
Stream flow area =      16.000(Ac.)
Runoff from this stream =      31.903(CFS)
Time of concentration =   17.31 min.
Rainfall intensity =     2.313(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       TC            Rainfall Intensity
 No.        (CFS)        (min)                 (In/Hr)


1        59.555      17.84                2.271
2        31.903      17.31                2.313
Qmax(1) =
          1.000 *     1.000 *     59.555) +
          0.981 *     1.000 *     31.903) + =       90.852
Qmax(2) =
          1.019 *     0.970 *     59.555) +
          1.000 *     1.000 *     31.903) + =       90.778

Total of 2 streams to confluence:
Flow rates before confluence point:
      59.555      31.903
Maximum flow rates at confluence using above data:
       90.852       90.778
Area of streams before confluence:
       28.584       16.000
Effective area values after confluence:
       44.584       43.723
Results of confluence:
Total flow rate =      90.852(CFS)
Time of concentration =     17.844 min.
Effective stream area after confluence =      44.584(Ac.)
Stream Area average Pervious fraction(Ap) =  0.100
Stream Area average soil loss rate(Fm) =    0.093(In/Hr)
Study area (this main stream) =       44.58(Ac.)


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Process from Point/Station       61.000 to Point/Station       62.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1076.700(Ft.)
Downstream point/station elevation =  1065.000(Ft.)
Pipe length  =  1320.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    90.852(CFS)
Given pipe size =     48.00(In.)
Calculated individual pipe flow  =    90.852(CFS)
Normal flow depth in pipe =   28.78(In.)
Flow top width inside pipe =   47.04(In.)
Critical Depth =   34.69(In.)
Pipe flow velocity =     11.54(Ft/s)
Travel time through pipe =    1.91 min.
Time of concentration (TC) =    19.75 min.


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Process from Point/Station       62.000 to Point/Station       62.000
**** CONFLUENCE OF MINOR STREAMS ****
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Along Main Stream number: 1 in normal stream number 1
Stream flow area =      44.584(Ac.)
Runoff from this stream =      90.852(CFS)
Time of concentration =   19.75 min.
Rainfall intensity =     2.137(In/Hr)
Area averaged loss rate (Fm) =    0.0928(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000

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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 =  1000.000(Ft.)
Top (of initial area) elevation =  1090.500(Ft.)
Bottom (of initial area) elevation =  1084.500(Ft.)
Difference in elevation =      6.000(Ft.)
Slope =    0.00600  s(%)=       0.60
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.404 min.
Rainfall intensity =      2.697(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.867
Subarea runoff =     12.864(CFS)
Total initial stream area =        5.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)

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Process from Point/Station      210.000 to Point/Station      211.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =  1084.500(Ft.)
End of street segment elevation =  1076.500(Ft.)
Length of street segment  =   875.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     25.728(CFS)
Depth of flow =   0.492(Ft.), Average velocity =   3.208(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  19.846(Ft.)
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Flow velocity =   3.21(Ft/s)
Travel time =    4.55 min.     TC =   17.95  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Rainfall intensity =      2.263(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.868
Subarea runoff =     19.533(CFS) for   11.000(Ac.)
Total runoff =     32.397(CFS)
Effective area this stream =       16.50(Ac.)
Total Study Area (Main Stream No. 1) =       62.50(Ac.)
Area averaged Fm value =    0.082(In/Hr)
Street flow at end of street =     32.397(CFS)
Half street flow at end of street =     16.198(CFS)
Depth of flow =   0.523(Ft.), Average velocity =   3.505(Ft/s)
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      211.000 to Point/Station      211.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     16.500(Ac.)
Runoff from this stream =     32.397(CFS)
Time of concentration =   17.95 min.
Rainfall intensity =     2.263(In/Hr)
Area averaged loss rate (Fm) =    0.0815(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


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Process from Point/Station      212.000 to Point/Station      213.000
**** 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 =  1000.000(Ft.)
Top (of initial area) elevation =  1092.600(Ft.)
Bottom (of initial area) elevation =  1086.000(Ft.)
Difference in elevation =     6.600(Ft.)
Slope =    0.00660  s(%)=       0.66
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.151 min.
Rainfall intensity =      2.728(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.868
Subarea runoff =     11.834(CFS)
Total initial stream area =       5.000(Ac.)
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Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station      213.000 to Point/Station      214.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1086.000(Ft.)
End of street segment elevation =  1076.500(Ft.)
Length of street segment  =  1000.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     23.668(CFS)
Depth of flow =   0.477(Ft.), Average velocity =   3.188(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  19.081(Ft.)
Flow velocity =   3.19(Ft/s)
Travel time =    5.23 min.     TC =   18.38  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 =      2.231(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.861
Subarea runoff =     16.968(CFS) for   10.000(Ac.)
Total runoff =     28.802(CFS)
Effective area this stream =       15.00(Ac.)
Total Study Area (Main Stream No. 1) =       77.50(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Street flow at end of street =     28.802(CFS)
Half street flow at end of street =     14.401(CFS)
Depth of flow =   0.504(Ft.), Average velocity =   3.384(Ft/s)
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      214.000 to Point/Station      214.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =     15.000(Ac.)
Runoff from this stream =     28.802(CFS)
Time of concentration =   18.38 min.
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Rainfall intensity =     2.231(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      TC            Rainfall Intensity
 No.        (CFS)       (min)                 (In/Hr)


1        90.852     19.75                2.137
2        32.397     17.95                2.263
3        28.802     18.38                2.231
Qmax(1) =
          1.000 *    1.000 *    90.852) +
          0.942 *    1.000 *    32.397) +
          0.956 *    1.000 *    28.802) + =     148.904
Qmax(2) =
          1.062 *    0.909 *    90.852) +
          1.000 *    1.000 *    32.397) +
          1.015 *    0.977 *    28.802) + =     148.612
Qmax(3) =
          1.046 *    0.931 *    90.852) +
          0.985 *    1.000 *    32.397) +
          1.000 *    1.000 *    28.802) + =     149.169

Total of 3 streams to confluence:
Flow rates before confluence point:
      90.852      32.397      28.802
Maximum flow rates at confluence using above data:
      148.904      148.612      149.169
Area of streams before confluence:
       44.584       16.500       15.000
Effective area values after confluence:
       76.084       71.669       72.987
Results of confluence:
Total flow rate =    149.169(CFS)
Time of concentration =    18.379 min.
Effective stream area after confluence =     72.987(Ac.)
Stream Area average Pervious fraction(Ap) =  0.100
Stream Area average soil loss rate(Fm) =    0.091(In/Hr)
Study area (this main stream) =      76.08(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       62.000 to Point/Station       63.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1065.000(Ft.)
Downstream point/station elevation =  1042.200(Ft.)
Pipe length  =  1320.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   149.169(CFS)
Given pipe size =     54.00(In.)
Calculated individual pipe flow  =   149.169(CFS)
Normal flow depth in pipe =   29.44(In.)
Flow top width inside pipe =   53.78(In.)
Critical Depth =   42.99(In.)
Pipe flow velocity =     16.83(Ft/s)
Travel time through pipe =    1.31 min.
Time of concentration (TC) =    19.69 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       63.000 to Point/Station       63.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     72.987(Ac.)
Runoff from this stream =    149.169(CFS)
Time of concentration =   19.69 min.
Rainfall intensity =     2.141(In/Hr)
Area averaged loss rate (Fm) =    0.0914(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      215.000 to Point/Station      216.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1074.600(Ft.)
Bottom (of initial area) elevation =  1071.000(Ft.)
Difference in elevation =     3.600(Ft.)
Slope =    0.00360  s(%)=       0.36
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.846 min.
Rainfall intensity =      2.536(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.874
Subarea runoff =     12.191(CFS)
Total initial stream area =        5.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.073(In/Hr)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      216.000 to Point/Station      217.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
Top of street segment elevation =  1071.000(Ft.)
End of street segment elevation =  1063.700(Ft.)
Length of street segment  =   875.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     24.382(CFS)
```

```
Depth of flow =   0.491(Ft.), Average velocity =   3.058(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  19.786(Ft.)
Flow velocity =   3.06(Ft/s)
Travel time =    4.77 min.     TC =   19.61  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Rainfall intensity =      2.146(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.869
Subarea runoff =     18.586(CFS) for   11.000(Ac.)
Total runoff =     30.776(CFS)
Effective area this stream =       16.50(Ac.)
Total Study Area (Main Stream No. 1) =       94.00(Ac.)
Area averaged Fm value =    0.073(In/Hr)
Street flow at end of street =     30.776(CFS)
Half street flow at end of street =     15.388(CFS)
Depth of flow =   0.522(Ft.), Average velocity =   3.341(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      217.000 to Point/Station      217.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     16.500(Ac.)
Runoff from this stream =     30.776(CFS)
Time of concentration =   19.61 min.
Rainfall intensity =     2.146(In/Hr)
Area averaged loss rate (Fm) =    0.0734(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


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Process from Point/Station       63.000 to Point/Station       63.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 54.95
Pervious ratio(Ap) = 0.1110     Max loss rate(Fm)=     0.083(In/Hr)
Rainfall intensity =      2.049(In/Hr) for a    25.0 year storm
User specified values are as follows:
TC =  21.19 min.  Rain intensity =       2.05(In/Hr)
Total area this stream =       203.15(Ac.)
Total Study Area (Main Stream No. 1) =      297.15(Ac.)
Total runoff =    403.88(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       63.000 to Point/Station       63.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
```

```
Along Main Stream number: 1 in normal stream number 3
Stream flow area =    203.150(Ac.)
Runoff from this stream =    403.880(CFS)
Time of concentration =   21.19 min.
Rainfall intensity =     2.049(In/Hr)
Area averaged loss rate (Fm) =    0.0830(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1110
Summary of stream data:

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


1       149.169      19.69               2.141
2        30.776      19.61               2.146
3       403.880      21.19               2.049
Qmax(1) =
          1.000 *     1.000 *   149.169) +
          0.998 *     1.000 *    30.776) +
          1.047 *     0.929 *   403.880) + =     572.752
Qmax(2) =
          1.002 *     0.996 *   149.169) +
          1.000 *     1.000 *    30.776) +
          1.049 *     0.926 *   403.880) + =     572.081
Qmax(3) =
          0.955 *     1.000 *   149.169) +
          0.953 *     1.000 *    30.776) +
          1.000 *     1.000 *   403.880) + =     575.650

Total of 3 streams to confluence:
Flow rates before confluence point:
     149.169      30.776     403.880
Maximum flow rates at confluence using above data:
      572.752      572.081      575.650
Area of streams before confluence:
       72.987       16.500      203.150
Effective area values after confluence:
      278.220      277.266      292.637
Results of confluence:
Total flow rate =    575.650(CFS)
Time of concentration =    21.190 min.
Effective stream area after confluence =    292.637(Ac.)
Stream Area average Pervious fraction(Ap) =  0.108
Stream Area average soil loss rate(Fm) =    0.085(In/Hr)
Study area (this main stream) =     292.64(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       63.000 to Point/Station       64.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1039.100(Ft.)
Downstream point/station elevation =  1033.800(Ft.)
Pipe length  =  1320.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   575.650(CFS)
Given pipe size =     90.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     6.071(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      7.416(Ft.)
 Minor friction loss =     3.955(Ft.)    K-factor =   1.50
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Pipe flow velocity =     13.03(Ft/s)
Travel time through pipe =    1.69 min.
Time of concentration (TC) =    22.88 min.


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Process from Point/Station       64.000 to Point/Station       64.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    292.637(Ac.)
Runoff from this stream =    575.650(CFS)
Time of concentration =   22.88 min.
Rainfall intensity =     1.957(In/Hr)
Area averaged loss rate (Fm) =    0.0845(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1076


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      218.000 to Point/Station      219.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1065.500(Ft.)
Bottom (of initial area) elevation =  1059.000(Ft.)
Difference in elevation =     6.500(Ft.)
Slope =    0.00650  s(%)=       0.65
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   16.880 min.
Rainfall intensity =      2.348(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.759
Subarea runoff =      8.915(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.367(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      219.000 to Point/Station      220.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
Top of street segment elevation =  1059.000(Ft.)
End of street segment elevation =  1056.500(Ft.)
Length of street segment  =   500.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     16.048(CFS)
Depth of flow =   0.467(Ft.), Average velocity =   2.274(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  18.592(Ft.)
Flow velocity =   2.27(Ft/s)
Travel time =    3.66 min.     TC =   20.54  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Rainfall intensity =      2.087(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.742
Subarea runoff =     11.210(CFS) for    8.000(Ac.)
Total runoff =     20.126(CFS)
Effective area this stream =       13.00(Ac.)
Total Study Area (Main Stream No. 1) =      310.15(Ac.)
Area averaged Fm value =    0.367(In/Hr)
Street flow at end of street =     20.126(CFS)
Half street flow at end of street =     10.063(CFS)
Depth of flow =   0.499(Ft.), Average velocity =   2.419(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      220.000 to Point/Station      221.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1056.500(Ft.)
End of street segment elevation =  1051.200(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(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 [1] side(s) of the street
Distance from curb to property line  =  13.000(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 =     30.188(CFS)
Depth of flow =   0.658(Ft.), Average velocity =   3.776(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  28.148(Ft.)
Flow velocity =   3.78(Ft/s)
Travel time =    2.91 min.     TC =   23.46  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Rainfall intensity =      1.927(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.729
Subarea runoff =     16.391(CFS) for   13.000(Ac.)
Total runoff =     36.516(CFS)
Effective area this stream =       26.00(Ac.)
Total Study Area (Main Stream No. 1) =      323.15(Ac.)
Area averaged Fm value =    0.367(In/Hr)
Street flow at end of street =     36.516(CFS)
Half street flow at end of street =     36.516(CFS)
Depth of flow =   0.708(Ft.), Average velocity =   3.842(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    2.06(Ft.)
Flow width (from curb towards crown)=  30.644(Ft.)


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Process from Point/Station      221.000 to Point/Station      221.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     26.000(Ac.)
Runoff from this stream =     36.516(CFS)
Time of concentration =   23.46 min.
Rainfall intensity =     1.927(In/Hr)
Area averaged loss rate (Fm) =    0.3670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

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


1       575.650      22.88                1.957
2        36.516      23.46                1.927
Qmax(1) =
          1.000 *     1.000 *   575.650) +
          1.019 *     0.975 *    36.516) + =      611.929
Qmax(2) =
          0.984 *     1.000 *   575.650) +
          1.000 *     1.000 *    36.516) + =      603.223

Total of 2 streams to confluence:
Flow rates before confluence point:
     575.650      36.516
Maximum flow rates at confluence using above data:
      611.929      603.223
Area of streams before confluence:
      292.637       26.000
Effective area values after confluence:
      317.996      318.637
Results of confluence:
Total flow rate =    611.929(CFS)
Time of concentration =    22.878 min.
Effective stream area after confluence =    317.996(Ac.)
```

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Stream Area average Pervious fraction(Ap) =  0.140
Stream Area average soil loss rate(Fm) =    0.108(In/Hr)
Study area (this main stream) =     318.64(Ac.)


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Process from Point/Station       64.000 to Point/Station       71.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1033.800(Ft.)
Downstream point/station elevation =  1030.000(Ft.)
Pipe length =   660.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow =   611.929(CFS)
Given pipe size =     90.00(In.)
Calculated individual pipe flow =   611.929(CFS)
Normal flow depth in pipe =   78.75(In.)
Flow top width inside pipe =   59.53(In.)
Critical Depth =   76.01(In.)
Pipe flow velocity =     14.94(Ft/s)
Travel time through pipe =    0.74 min.
Time of concentration (TC) =    23.61 min.


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Process from Point/Station       71.000 to Point/Station       71.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    317.996(Ac.)
Runoff from this stream =    611.929(CFS)
Time of concentration =   23.61 min.
Rainfall intensity =     1.920(In/Hr)
Area averaged loss rate (Fm) =    0.1076(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1397


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Process from Point/Station       71.000 to Point/Station       71.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------------
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 56.12
Pervious ratio(Ap) = 0.4520     Max loss rate(Fm)=     0.331(In/Hr)
Rainfall intensity =     1.822(In/Hr) for a    25.0 year storm
User specified values are as follows:
TC =  25.76 min.  Rain intensity =      1.82(In/Hr)
Total area this stream =      202.68(Ac.)
Total Study Area (Main Stream No. 1) =      525.83(Ac.)
Total runoff =    307.34(CFS)


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Process from Point/Station       71.000 to Point/Station       71.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =    202.680(Ac.)
Runoff from this stream =    307.340(CFS)
Time of concentration =   25.76 min.
Rainfall intensity =     1.822(In/Hr)
```

```
Area averaged loss rate (Fm) =    0.3310(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4520
Summary of stream data:

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

1       611.929      23.61                1.920
2       307.340      25.76                1.822
Qmax(1) =
          1.000 *    1.000 *   611.929) +
          1.065 *    0.917 *   307.340) + =     912.114
Qmax(2) =
          0.946 *    1.000 *   611.929) +
          1.000 *    1.000 *   307.340) + =     886.319

Total of 2 streams to confluence:
Flow rates before confluence point:
     611.929     307.340
Maximum flow rates at confluence using above data:
      912.114      886.319
Area of streams before confluence:
      317.996      202.680
Effective area values after confluence:
      503.799      520.676
Results of confluence:
Total flow rate =    912.114(CFS)
Time of concentration =    23.615 min.
Effective stream area after confluence =    503.799(Ac.)
Stream Area average Pervious fraction(Ap) =  0.261
Stream Area average soil loss rate(Fm) =    0.195(In/Hr)
Study area (this main stream) =     520.68(Ac.)


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Process from Point/Station       71.000 to Point/Station       89.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1030.000(Ft.)
Downstream point/station elevation =  1025.000(Ft.)
Pipe length  =   680.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   912.114(CFS)
Given pipe size =    108.00(In.)
Calculated individual pipe flow  =   912.114(CFS)
Normal flow depth in pipe =   76.59(In.)
Flow top width inside pipe =   98.09(In.)
Critical Depth =   89.02(In.)
Pipe flow velocity =     18.90(Ft/s)
Travel time through pipe =    0.60 min.
Time of concentration (TC) =    24.21 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       89.000 to Point/Station       89.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    503.799(Ac.)
Runoff from this stream =    912.114(CFS)
Time of concentration =   24.21 min.
```

Rainfall intensity = 1.891(In/Hr)
Area averaged loss rate (Fm) = 0.1946(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2612

++
Process from Point/Station 89.000 to Point/Station 89.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 74.49
Pervious ratio(Ap) = 0.8260 Max loss rate(Fm)= 0.381(In/Hr)
Rainfall intensity = 2.805(In/Hr) for a 25.0 year storm
User specified values are as follows:
TC = 12.55 min. Rain intensity = 2.81(In/Hr)
Total area this stream = 316.80(Ac.)
Total Study Area (Main Stream No. 1) = 842.63(Ac.)
Total runoff = 795.18(CFS)

++
Process from Point/Station 89.000 to Point/Station 89.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 316.800(Ac.)
Runoff from this stream = 795.180(CFS)
Time of concentration = 12.55 min.
Rainfall intensity = 2.805(In/Hr)
Area averaged loss rate (Fm) = 0.3810(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8260
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	912.114	24.21	1.891
2	795.180	12.55	2.805

Qmax(1) =
1.000 * 1.000 * 912.114) +
0.623 * 1.000 * 795.180) + = 1407.437
Qmax(2) =
1.539 * 0.518 * 912.114) +
1.000 * 1.000 * 795.180) + = 1522.641

Total of 2 streams to confluence:
Flow rates before confluence point:
912.114 795.180
Maximum flow rates at confluence using above data:
1407.437 1522.641
Area of streams before confluence:
503.799 316.800
Effective area values after confluence:
820.599 577.909
Results of confluence:
Total flow rate = 1522.641(CFS)
Time of concentration = 12.550 min.
Effective stream area after confluence = 577.909(Ac.)
Stream Area average Pervious fraction(Ap) = 0.479

Stream Area average soil loss rate(Fm) = 0.267(In/Hr)
Study area (this main stream) = 820.60(Ac.)
End of computations, Total Study Area = 842.63 (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) = 0.473
Area averaged SCS curve number = 61.1

LINE "DZ-4"

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
Rational Hydrology Study Date: 08/03/04

FONTANA / LINE DZ-4 HYDROLOGY
25 YEAR STORM
JN 04339

Hall & Forman, Inc. - S/N 950

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

Rational hydrology study storm event year is 25.0
10 Year storm 1 hour rainfall = 0.930(In.)
100 Year storm 1 hour rainfall = 1.350(In.)
Computed rainfall intensity:
Storm year = 25.00 1 hour rainfall = 1.097 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

++
Process from Point/Station 600.000 to Point/Station 601.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 56.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.073(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 1065.000(Ft.)
Bottom (of initial area) elevation = 1060.000(Ft.)
Difference in elevation = 5.000(Ft.)
Slope = 0.00500 s(%)= 0.50
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 13.902 min.
Rainfall intensity = 2.638(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.875
Subarea runoff = 11.541(CFS)
Total initial stream area = 5.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.073(In/Hr)

++
Process from Point/Station 601.000 to Point/Station 602.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1060.000(Ft.)
End of street segment elevation = 1058.300(Ft.)

```
Length of street segment   =   330.000(Ft.)
Height of curb above gutter flowline   =    8.0(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 =     17.312(CFS)
Depth of flow =   0.476(Ft.), Average velocity =   2.344(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  19.032(Ft.)
Flow velocity =   2.34(Ft/s)
Travel time =    2.35 min.     TC =   16.25  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Rainfall intensity =      2.402(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.873
Subarea runoff =      9.420(CFS) for    5.000(Ac.)
Total runoff =     20.962(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =       10.00(Ac.)
Area averaged Fm value =    0.073(In/Hr)
Street flow at end of street =     20.962(CFS)
Half street flow at end of street =     10.481(CFS)
Depth of flow =   0.503(Ft.), Average velocity =   2.480(Ft/s)
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      602.000 to Point/Station      603.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1058.300(Ft.)
End of street segment elevation =  1055.000(Ft.)
Length of street segment   =   660.000(Ft.)
Height of curb above gutter flowline   =    8.0(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 =    31.443(CFS)
Depth of flow =   0.564(Ft.), Average velocity =   2.888(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 =   2.89(Ft/s)
Travel time =    3.81 min.      TC =   20.06  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Rainfall intensity =      2.117(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.869
Subarea runoff =     15.828(CFS) for   10.000(Ac.)
Total runoff =     36.790(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 1) =       20.00(Ac.)
Area averaged Fm value =    0.073(In/Hr)
Street flow at end of street =     36.790(CFS)
Half street flow at end of street =     18.395(CFS)
Depth of flow =   0.591(Ft.), Average velocity =   3.073(Ft/s)
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      603.000 to Point/Station      607.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1055.000(Ft.)
End of street segment elevation =  1052.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(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 [1] side(s) of the street
Distance from curb to property line  =  13.000(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 =    36.790(CFS)
Depth of flow =   0.784(Ft.), Average velocity =   2.991(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    5.89(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  34.469(Ft.)
Flow velocity =   2.99(Ft/s)
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Travel time =    3.68 min.      TC =   23.74  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Rainfall intensity =      1.914(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.865
Subarea runoff =      0.000(CFS) for    0.000(Ac.)
Total runoff =     36.790(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 1) =       20.00(Ac.)
Area averaged Fm value =    0.073(In/Hr)
Street flow at end of street =     36.790(CFS)
Half street flow at end of street =     36.790(CFS)
Depth of flow =   0.784(Ft.), Average velocity =   2.991(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    5.89(Ft.)
Flow width (from curb towards crown)=  34.469(Ft.)


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Process from Point/Station      607.000 to Point/Station      607.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     20.000(Ac.)
Runoff from this stream =     36.790(CFS)
Time of concentration =   23.74 min.
Rainfall intensity =     1.914(In/Hr)
Area averaged loss rate (Fm) =    0.0734(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


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Process from Point/Station      604.000 to Point/Station      605.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1062.900(Ft.)
Bottom (of initial area) elevation =  1057.900(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.902 min.
Rainfall intensity =      2.638(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.875
Subarea runoff =     11.541(CFS)
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Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.073(In/Hr)


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Process from Point/Station      605.000 to Point/Station      606.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1057.900(Ft.)
End of street segment elevation =  1055.900(Ft.)
Length of street segment   =   330.000(Ft.)
Height of curb above gutter flowline   =    8.0(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 =     17.312(CFS)
Depth of flow =   0.464(Ft.), Average velocity =   2.492(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  18.447(Ft.)
Flow velocity =   2.49(Ft/s)
Travel time =    2.21 min.     TC =   16.11  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)   = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Rainfall intensity =      2.415(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.873
Subarea runoff =      9.532(CFS) for    5.000(Ac.)
Total runoff =     21.074(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =       30.00(Ac.)
Area averaged Fm value =    0.073(In/Hr)
Street flow at end of street =     21.074(CFS)
Half street flow at end of street =     10.537(CFS)
Depth of flow =   0.493(Ft.), Average velocity =   2.616(Ft/s)
Flow width (from curb towards crown)=  19.892(Ft.)


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Process from Point/Station      606.000 to Point/Station      607.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1055.900(Ft.)
End of street segment elevation =  1052.000(Ft.)
Length of street segment   =   660.000(Ft.)
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Height of curb above gutter flowline  =    8.0(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 =     31.611(CFS)
Depth of flow =   0.551(Ft.), Average velocity =   3.043(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 =   3.04(Ft/s)
Travel time =    3.61 min.     TC =   19.72  min.
 Adding area flow to street
CONDOMINIUM subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.3500     Max loss rate(Fm)=     0.257(In/Hr)
Rainfall intensity =      2.139(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.831
Subarea runoff =     14.451(CFS) for   10.000(Ac.)
Total runoff =     35.524(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 1) =       40.00(Ac.)
Area averaged Fm value =    0.165(In/Hr)
Street flow at end of street =     35.524(CFS)
Half street flow at end of street =     17.762(CFS)
Depth of flow =   0.570(Ft.), Average velocity =   3.187(Ft/s)
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      607.000 to Point/Station      607.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     20.000(Ac.)
Runoff from this stream =     35.524(CFS)
Time of concentration =   19.72 min.
Rainfall intensity =     2.139(In/Hr)
Area averaged loss rate (Fm) =    0.1651(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2250
Summary of stream data:

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

```
1        36.790      23.74                    1.914
2        35.524      19.72                    2.139
Qmax(1) =
            1.000 *     1.000 *     36.790) +
            0.886 *     1.000 *     35.524) + =       68.267
Qmax(2) =
            1.122 *     0.831 *     36.790) +
            1.000 *     1.000 *     35.524) + =       69.831

Total of 2 streams to confluence:
Flow rates before confluence point:
      36.790       35.524
Maximum flow rates at confluence using above data:
       68.267        69.831
Area of streams before confluence:
       20.000        20.000
Effective area values after confluence:
       40.000        36.620
Results of confluence:
Total flow rate =      69.831(CFS)
Time of concentration =     19.724 min.
Effective stream area after confluence =      36.620(Ac.)
Stream Area average Pervious fraction(Ap) =  0.163
Stream Area average soil loss rate(Fm) =     0.119(In/Hr)
Study area (this main stream) =       40.00(Ac.)


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Process from Point/Station       607.000 to Point/Station        45.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1047.000(Ft.)
Downstream point/station elevation =  1041.000(Ft.)
Pipe length  =   660.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    69.831(CFS)
Given pipe size =     42.00(In.)
Calculated individual pipe flow  =    69.831(CFS)
Normal flow depth in pipe =   26.58(In.)
Flow top width inside pipe =   40.49(In.)
Critical Depth =   31.40(In.)
Pipe flow velocity =     10.88(Ft/s)
Travel time through pipe =    1.01 min.
Time of concentration (TC) =    20.74 min.


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Process from Point/Station        45.000 to Point/Station        45.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      36.620(Ac.)
Runoff from this stream =      69.831(CFS)
Time of concentration =   20.74 min.
Rainfall intensity =     2.075(In/Hr)
Area averaged loss rate (Fm) =    0.1193(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1625


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Process from Point/Station       608.000 to Point/Station       609.000
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**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000    Max loss rate(Fm)=     0.073(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1060.800(Ft.)
Bottom (of initial area) elevation =  1055.800(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=      0.50
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.902 min.
Rainfall intensity =      2.638(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.875
Subarea runoff =     11.541(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.073(In/Hr)


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Process from Point/Station     609.000 to Point/Station     610.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1055.800(Ft.)
End of street segment elevation =  1053.500(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     17.312(CFS)
Depth of flow =   0.454(Ft.), Average velocity =   2.626(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  17.958(Ft.)
Flow velocity =   2.63(Ft/s)
Travel time =    2.09 min.     TC =   16.00  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000    Max loss rate(Fm)=     0.073(In/Hr)
Rainfall intensity =      2.425(In/Hr) for a    25.0 year storm
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Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.873
Subarea runoff =      9.624(CFS) for    5.000(Ac.)
Total runoff =     21.166(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =       50.00(Ac.)
Area averaged Fm value =    0.073(In/Hr)
Street flow at end of street =     21.166(CFS)
Half street flow at end of street =     10.583(CFS)
Depth of flow =   0.483(Ft.), Average velocity =   2.760(Ft/s)
Flow width (from curb towards crown)=  19.399(Ft.)


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Process from Point/Station      610.000 to Point/Station      611.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1053.500(Ft.)
End of street segment elevation =  1049.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     31.749(CFS)
Depth of flow =   0.541(Ft.), Average velocity =   3.183(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 =   3.18(Ft/s)
Travel time =    3.46 min.     TC =   19.45  min.
 Adding area flow to street
CONDOMINIUM subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.3500     Max loss rate(Fm)=     0.257(In/Hr)
Rainfall intensity =      2.157(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.831
Subarea runoff =     14.680(CFS) for   10.000(Ac.)
Total runoff =     35.846(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 1) =       60.00(Ac.)
Area averaged Fm value =    0.165(In/Hr)
Street flow at end of street =     35.846(CFS)
Half street flow at end of street =     17.923(CFS)
Depth of flow =   0.560(Ft.), Average velocity =   3.340(Ft/s)
Note:  depth of flow exceeds top of street crown.
```

Flow width (from curb towards crown)= 20.000(Ft.)

++
Process from Point/Station 611.000 to Point/Station 611.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 20.000(Ac.)
Runoff from this stream = 35.846(CFS)
Time of concentration = 19.45 min.
Rainfall intensity = 2.157(In/Hr)
Area averaged loss rate (Fm) = 0.1651(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2250
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	69.831	20.74	2.075
2	35.846	19.45	2.157

Qmax(1) =
1.000 * 1.000 * 69.831) +
0.959 * 1.000 * 35.846) + = 104.218

Qmax(2) =
1.041 * 0.938 * 69.831) +
1.000 * 1.000 * 35.846) + = 104.072

Total of 2 streams to confluence:
Flow rates before confluence point:
69.831 35.846
Maximum flow rates at confluence using above data:
104.218 104.072
Area of streams before confluence:
36.620 20.000
Effective area values after confluence:
56.620 54.354
Results of confluence:
Total flow rate = 104.218(CFS)
Time of concentration = 20.736 min.
Effective stream area after confluence = 56.620(Ac.)
Stream Area average Pervious fraction(Ap) = 0.185
Stream Area average soil loss rate(Fm) = 0.135(In/Hr)
Study area (this main stream) = 56.62(Ac.)

++
Process from Point/Station 45.000 to Point/Station 90.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1040.000(Ft.)
Downstream point/station elevation = 1025.000(Ft.)
Pipe length = 750.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 104.218(CFS)
Given pipe size = 54.00(In.)
Calculated individual pipe flow = 104.218(CFS)
Normal flow depth in pipe = 22.90(In.)
Flow top width inside pipe = 53.37(In.)
Critical Depth = 35.99(In.)

```
Pipe flow velocity =     16.23(Ft/s)
Travel time through pipe =    0.77 min.
Time of concentration (TC) =    21.51 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        90.000 to Point/Station        90.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     56.620(Ac.)
Runoff from this stream =    104.218(CFS)
Time of concentration =   21.51 min.
Rainfall intensity =     2.031(In/Hr)
Area averaged loss rate (Fm) =    0.1355(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1846


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      612.000 to Point/Station      613.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1058.700(Ft.)
Bottom (of initial area) elevation =  1053.700(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.902 min.
Rainfall intensity =      2.638(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.875
Subarea runoff =     11.541(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.073(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      613.000 to Point/Station      614.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
Top of street segment elevation =  1053.700(Ft.)
End of street segment elevation =  1051.100(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     17.312(CFS)
Depth of flow =   0.446(Ft.), Average velocity =   2.750(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  17.539(Ft.)
Flow velocity =   2.75(Ft/s)
Travel time =    2.00 min.     TC =   15.90  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.073(In/Hr)
Rainfall intensity =     2.434(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.873
Subarea runoff =      9.702(CFS) for    5.000(Ac.)
Total runoff =     21.244(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =       70.00(Ac.)
Area averaged Fm value =    0.073(In/Hr)
Street flow at end of street =     21.244(CFS)
Half street flow at end of street =     10.622(CFS)
Depth of flow =   0.474(Ft.), Average velocity =   2.893(Ft/s)
Flow width (from curb towards crown)=  18.975(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      614.000 to Point/Station      615.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1051.100(Ft.)
End of street segment elevation =  1046.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     31.865(CFS)
Depth of flow =   0.532(Ft.), Average velocity =   3.310(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 =   3.31(Ft/s)
Travel time =    3.32 min.     TC =   19.23  min.
```

```
 Adding area flow to street
CONDOMINIUM subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.3500     Max loss rate(Fm)=     0.257(In/Hr)
Rainfall intensity =     2.172(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.832
Subarea runoff =     14.877(CFS) for   10.000(Ac.)
Total runoff =     36.121(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 1) =       80.00(Ac.)
Area averaged Fm value =    0.165(In/Hr)
Street flow at end of street =     36.121(CFS)
Half street flow at end of street =     18.060(CFS)
Depth of flow =   0.551(Ft.), Average velocity =   3.479(Ft/s)
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      615.000 to Point/Station      615.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     20.000(Ac.)
Runoff from this stream =     36.121(CFS)
Time of concentration =   19.23 min.
Rainfall intensity =     2.172(In/Hr)
Area averaged loss rate (Fm) =    0.1651(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2250
Summary of stream data:

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


1       104.218      21.51                    2.031
2        36.121      19.23                    2.172
Qmax(1) =
            1.000 *    1.000 *   104.218) +
            0.930 *    1.000 *    36.121) + =      137.795
Qmax(2) =
            1.075 *    0.894 *   104.218) +
            1.000 *    1.000 *    36.121) + =      136.232

Total of 2 streams to confluence:
Flow rates before confluence point:
     104.218      36.121
Maximum flow rates at confluence using above data:
      137.795      136.232
Area of streams before confluence:
       56.620       20.000
Effective area values after confluence:
       76.620       70.615
Results of confluence:
Total flow rate =    137.795(CFS)
```

Time of concentration = 21.506 min.
Effective stream area after confluence = 76.620(Ac.)
Stream Area average Pervious fraction(Ap) = 0.195
Stream Area average soil loss rate(Fm) = 0.143(In/Hr)
Study area (this main stream) = 76.62(Ac.)
End of computations, Total Study Area = 80.00 (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) = 0.194
Area averaged SCS curve number = 56.0

LINE "DZ-4A"

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
Rational Hydrology Study Date: 08/03/04

FONTANA / LINE DZ-4A HYDROLOGY
25 YEAR STORM
JN 04339

Hall & Forman, Inc. - S/N 950

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

Rational hydrology study storm event year is 25.0
10 Year storm 1 hour rainfall = 0.930(In.)
100 Year storm 1 hour rainfall = 1.350(In.)
Computed rainfall intensity:
Storm year = 25.00 1 hour rainfall = 1.097 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

++
Process from Point/Station 625.000 to Point/Station 626.000
**** INITIAL AREA EVALUATION ****

RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 56.00
Pervious ratio(Ap) = 0.5000 Max loss rate(Fm)= 0.367(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 1058.000(Ft.)
Bottom (of initial area) elevation = 1051.300(Ft.)
Difference in elevation = 6.700(Ft.)
Slope = 0.00670 s(%)= 0.67
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 16.778 min.
Rainfall intensity = 2.357(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.760
Subarea runoff = 8.954(CFS)
Total initial stream area = 5.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value = 0.367(In/Hr)

++
Process from Point/Station 626.000 to Point/Station 627.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1051.300(Ft.)
End of street segment elevation = 1049.000(Ft.)

```
Length of street segment   =    330.000(Ft.)
Height of curb above gutter flowline   =     8.0(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 =      13.431(CFS)
Depth of flow =    0.421(Ft.), Average velocity =    2.467(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  16.282(Ft.)
Flow velocity =    2.47(Ft/s)
Travel time =     2.23 min.      TC =    19.01  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)   = 56.00
Pervious ratio(Ap) = 0.5000      Max loss rate(Fm)=      0.367(In/Hr)
Rainfall intensity =       2.187(In/Hr) for a     25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.749
Subarea runoff =       7.424(CFS) for     5.000(Ac.)
Total runoff =     16.378(CFS)
Effective area this stream =        10.00(Ac.)
Total Study Area (Main Stream No. 1) =        10.00(Ac.)
Area averaged Fm value =     0.367(In/Hr)
Street flow at end of street =      16.378(CFS)
Half street flow at end of street =       8.189(CFS)
Depth of flow =    0.447(Ft.), Average velocity =    2.591(Ft/s)
Flow width (from curb towards crown)=  17.578(Ft.)


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Process from Point/Station       627.000 to Point/Station       628.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1049.000(Ft.)
End of street segment elevation =  1044.600(Ft.)
Length of street segment   =    660.000(Ft.)
Height of curb above gutter flowline   =     8.0(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
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 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 =    24.567(CFS)
Depth of flow =   0.507(Ft.), Average velocity =   2.855(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 =   2.86(Ft/s)
Travel time =    3.85 min.     TC =   22.86  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Rainfall intensity =      1.958(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.731
Subarea runoff =     12.252(CFS) for   10.000(Ac.)
Total runoff =     28.630(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 1) =       20.00(Ac.)
Area averaged Fm value =    0.367(In/Hr)
Street flow at end of street =     28.630(CFS)
Half street flow at end of street =     14.315(CFS)
Depth of flow =   0.527(Ft.), Average velocity =   3.034(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      628.000 to Point/Station      629.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1044.600(Ft.)
End of street segment elevation =  1040.300(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(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 [1] side(s) of the street
Distance from curb to property line  =  13.000(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 =    42.945(CFS)
Depth of flow =   0.778(Ft.), Average velocity =   3.568(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    5.56(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  34.140(Ft.)
Flow velocity =   3.57(Ft/s)
Travel time =    3.08 min.     TC =   25.94  min.
```

```
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Rainfall intensity =     1.814(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.718
Subarea runoff =     23.479(CFS) for   20.000(Ac.)
Total runoff =     52.109(CFS)
Effective area this stream =       40.00(Ac.)
Total Study Area (Main Stream No. 1) =       40.00(Ac.)
Area averaged Fm value =    0.367(In/Hr)
Street flow at end of street =     52.109(CFS)
Half street flow at end of street =     52.109(CFS)
Depth of flow =   0.828(Ft.), Average velocity =   3.678(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    8.08(Ft.)
Flow width (from curb towards crown)=  36.667(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      629.000 to Point/Station       46.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1033.300(Ft.)
Downstream point/station elevation =  1026.000(Ft.)
Pipe length  =   660.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    52.109(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =    52.109(CFS)
Normal flow depth in pipe =   23.11(In.)
Flow top width inside pipe =   34.52(In.)
Critical Depth =   28.15(In.)
Pipe flow velocity =     10.87(Ft/s)
Travel time through pipe =    1.01 min.
Time of concentration (TC) =    26.95 min.


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Process from Point/Station      629.000 to Point/Station       46.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     40.000(Ac.)
Runoff from this stream =     52.109(CFS)
Time of concentration =   26.95 min.
Rainfall intensity =     1.773(In/Hr)
Area averaged loss rate (Fm) =    0.3670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000


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Process from Point/Station      630.000 to Point/Station      631.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
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```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1052.200(Ft.)
Bottom (of initial area) elevation =  1044.000(Ft.)
Difference in elevation =     8.200(Ft.)
Slope =    0.00820  s(%)=       0.82
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   16.113 min.
Rainfall intensity =      2.415(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.763
Subarea runoff =      9.214(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.367(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      631.000 to Point/Station      632.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1044.000(Ft.)
End of street segment elevation =  1041.300(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     13.821(CFS)
Depth of flow =   0.414(Ft.), Average velocity =   2.639(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  15.960(Ft.)
Flow velocity =   2.64(Ft/s)
Travel time =    2.08 min.     TC =   18.20  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Rainfall intensity =      2.245(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.753
Subarea runoff =      7.685(CFS) for    5.000(Ac.)
```

```
Total runoff =     16.899(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =       50.00(Ac.)
Area averaged Fm value =    0.367(In/Hr)
Street flow at end of street =     16.899(CFS)
Half street flow at end of street =      8.449(CFS)
Depth of flow =   0.440(Ft.), Average velocity =   2.773(Ft/s)
Flow width (from curb towards crown)=  17.250(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      632.000 to Point/Station      633.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
-------------------------------------------------------------------------------
Top of street segment elevation =  1041.300(Ft.)
End of street segment elevation =  1035.900(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     25.348(CFS)
Depth of flow =   0.498(Ft.), Average velocity =   3.075(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 =   3.07(Ft/s)
Travel time =    3.58 min.     TC =   21.77  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Rainfall intensity =      2.015(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.736
Subarea runoff =     12.774(CFS) for   10.000(Ac.)
Total runoff =     29.673(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 1) =       60.00(Ac.)
Area averaged Fm value =    0.367(In/Hr)
Street flow at end of street =     29.673(CFS)
Half street flow at end of street =     14.837(CFS)
Depth of flow =   0.518(Ft.), Average velocity =   3.273(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      633.000 to Point/Station      633.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      20.000(Ac.)
Runoff from this stream =      29.673(CFS)
Time of concentration =    21.77 min.
Rainfall intensity =      2.015(In/Hr)
Area averaged loss rate (Fm) =     0.3670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

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


1        52.109      26.95                    1.773
2        29.673      21.77                    2.015
Qmax(1) =
            1.000 *     1.000 *     52.109) +
            0.853 *     1.000 *     29.673) + =       77.421
Qmax(2) =
            1.172 *     0.808 *     52.109) +
            1.000 *     1.000 *     29.673) + =       79.019

Total of 2 streams to confluence:
Flow rates before confluence point:
      52.109       29.673
Maximum flow rates at confluence using above data:
       77.421       79.019
Area of streams before confluence:
       40.000       20.000
Effective area values after confluence:
       60.000       52.313
Results of confluence:
Total flow rate =      79.019(CFS)
Time of concentration =     21.775 min.
Effective stream area after confluence =      52.313(Ac.)
Stream Area average Pervious fraction(Ap) =  0.500
Stream Area average soil loss rate(Fm) =     0.367(In/Hr)
Study area (this main stream) =       60.00(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       46.000 to Point/Station       91.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1026.000(Ft.)
Downstream point/station elevation =  1014.500(Ft.)
Pipe length  =   750.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     79.019(CFS)
Given pipe size =      60.00(In.)
Calculated individual pipe flow  =     79.019(CFS)
Normal flow depth in pipe =    20.23(In.)
Flow top width inside pipe =    56.73(In.)
Critical Depth =    30.19(In.)
Pipe flow velocity =      13.58(Ft/s)
Travel time through pipe =     0.92 min.
Time of concentration (TC) =     22.70 min.
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       91.000 to Point/Station       91.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     52.313(Ac.)
Runoff from this stream =     79.019(CFS)
Time of concentration =   22.70 min.
Rainfall intensity =     1.966(In/Hr)
Area averaged loss rate (Fm) =    0.3670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      634.000 to Point/Station      635.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1046.800(Ft.)
Bottom (of initial area) elevation =  1041.800(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.275(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.755
Subarea runoff =     10.306(CFS)
Total initial stream area =        6.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.367(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      635.000 to Point/Station      636.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
Top of street segment elevation =  1041.800(Ft.)
End of street segment elevation =  1037.800(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(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
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```
 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 =     15.458(CFS)
Depth of flow =   0.404(Ft.), Average velocity =   3.146(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  15.445(Ft.)
Flow velocity =   3.15(Ft/s)
Travel time =    1.75 min.     TC =   19.54  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Rainfall intensity =      2.151(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.746
Subarea runoff =      8.962(CFS) for    6.000(Ac.)
Total runoff =     19.267(CFS)
Effective area this stream =       12.00(Ac.)
Total Study Area (Main Stream No. 1) =       72.00(Ac.)
Area averaged Fm value =    0.367(In/Hr)
Street flow at end of street =     19.267(CFS)
Half street flow at end of street =      9.634(CFS)
Depth of flow =   0.431(Ft.), Average velocity =   3.321(Ft/s)
Flow width (from curb towards crown)=  16.820(Ft.)


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Process from Point/Station      636.000 to Point/Station      637.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1037.800(Ft.)
End of street segment elevation =  1031.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     28.098(CFS)
Depth of flow =   0.496(Ft.), Average velocity =   3.434(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 =   3.43(Ft/s)
Travel time =    3.20 min.     TC =   22.74  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
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) = 0.5000     Max loss rate(Fm)=     0.489(In/Hr)
Rainfall intensity =      1.964(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.705
Subarea runoff =     12.577(CFS) for   11.000(Ac.)
Total runoff =     31.844(CFS)
Effective area this stream =       23.00(Ac.)
Total Study Area (Main Stream No. 1) =       83.00(Ac.)
Area averaged Fm value =    0.425(In/Hr)
Street flow at end of street =     31.844(CFS)
Half street flow at end of street =     15.922(CFS)
Depth of flow =   0.512(Ft.), Average velocity =   3.609(Ft/s)
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      637.000 to Point/Station      637.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     23.000(Ac.)
Runoff from this stream =     31.844(CFS)
Time of concentration =   22.74 min.
Rainfall intensity =     1.964(In/Hr)
Area averaged loss rate (Fm) =    0.4253(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

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


1       79.019     22.70                  1.966
2       31.844     22.74                  1.964
Qmax(1) =
           1.000 *    1.000 *    79.019) +
           1.002 *    0.998 *    31.844) + =     110.848
Qmax(2) =
           0.999 *    1.000 *    79.019) +
           1.000 *    1.000 *    31.844) + =     110.747

Total of 2 streams to confluence:
Flow rates before confluence point:
      79.019      31.844
Maximum flow rates at confluence using above data:
      110.848      110.747
Area of streams before confluence:
       52.313       23.000
Effective area values after confluence:
       75.267       75.313
Results of confluence:
Total flow rate =    110.848(CFS)
Time of concentration =    22.696 min.
Effective stream area after confluence =     75.267(Ac.)
Stream Area average Pervious fraction(Ap) =  0.500
```

Stream Area average soil loss rate(Fm) = 0.385(In/Hr)
Study area (this main stream) = 75.31(Ac.)
End of computations, Total Study Area = 83.00 (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) = 0.500
Area averaged SCS curve number = 52.8

LINE "14'×9' RCB"

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
Rational Hydrology Study Date: 01/13/05

FONTANA / LINE JURUPA AVE. 14'X 9' RCB HYDROLOGY
25 YEAR STORM
JN 04339

Hall & Forman, Inc. - S/N 950

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

Rational hydrology study storm event year is 25.0
10 Year storm 1 hour rainfall = 0.930(In.)
100 Year storm 1 hour rainfall = 1.350(In.)
Computed rainfall intensity:
Storm year = 25.00 1 hour rainfall = 1.097 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

++
Process from Point/Station 89.000 to Point/Station 89.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 68.38
Pervious ratio(Ap) = 0.4790 Max loss rate(Fm)= 0.267(In/Hr)
Rainfall intensity = 2.805(In/Hr) for a 25.0 year storm
User specified values are as follows:
TC = 12.55 min. Rain intensity = 2.81(In/Hr)
Total area this stream = 577.91(Ac.)
Total Study Area (Main Stream No. 1) = 577.91(Ac.)
Total runoff = 1522.64(CFS)

++
Process from Point/Station 89.000 to Point/Station 90.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Covered channel
Upstream point elevation = 1028.200(Ft.)
Downstream point elevation = 1022.300(Ft.)
Channel length thru subarea = 1320.000(Ft.)
Channel base width = 14.000(Ft.)
Slope or 'Z' of left channel bank = 0.000
Slope or 'Z' of right channel bank = 0.000
Manning's 'N' = 0.015
Maximum depth of channel = 9.000(Ft.)
Flow(q) thru subarea = 1522.640(CFS)
Depth of flow = 7.092(Ft.), Average velocity = 15.335(Ft/s)
Channel flow top width = 14.000(Ft.)
Flow Velocity = 15.33(Ft/s)
Travel time = 1.43 min.

```
Time of concentration =   13.98 min.
Critical depth =      7.125(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       90.000 to Point/Station       90.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    577.910(Ac.)
Runoff from this stream =   1522.640(CFS)
Time of concentration =   13.98 min.
Rainfall intensity =     2.629(In/Hr)
Area averaged loss rate (Fm) =    0.2670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4790


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       90.000 to Point/Station       90.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 56.05
Pervious ratio(Ap) = 0.1950     Max loss rate(Fm)=     0.143(In/Hr)
Rainfall intensity =      2.030(In/Hr) for a    25.0 year storm
User specified values are as follows:
TC =  21.51 min.  Rain intensity =       2.03(In/Hr)
Total area this stream =        76.62(Ac.)
Total Study Area (Main Stream No. 1) =      654.53(Ac.)
Total runoff =    137.80(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       90.000 to Point/Station       90.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     76.620(Ac.)
Runoff from this stream =    137.800(CFS)
Time of concentration =   21.51 min.
Rainfall intensity =     2.030(In/Hr)
Area averaged loss rate (Fm) =    0.1430(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1950


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Process from Point/Station      616.000 to Point/Station      617.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1540.000(Ft.)
Bottom (of initial area) elevation =  1160.000(Ft.)
```

```
Difference in elevation =   380.000(Ft.)
Slope =    0.38000  s(%)=      38.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.097 min.
Rainfall intensity =      3.196(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.786
Subarea runoff =     17.594(CFS)
Total initial stream area =        7.000(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      617.000 to Point/Station      618.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     40.214(CFS)
Depth of flow =   0.512(Ft.), Average velocity =   5.105(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00               5.00
      2            150.00               0.00
      3            300.00               5.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------------
Sub-Channel flow  =     40.214(CFS)
  '     '    flow top width =     30.747(Ft.)
  '     '    velocity=    5.105(Ft/s)
  '     '    area =      7.878(Sq.Ft)
  '     '    Froude number =     1.777

Upstream point elevation =  1160.000(Ft.)
Downstream point elevation =  1080.000(Ft.)
Flow length =   900.000(Ft.)
Travel time  =    2.94 min.
Time of concentration =   13.04 min.
Depth of flow =   0.512(Ft.)
Average velocity =   5.105(Ft/s)
Total irregular channel flow =    40.214(CFS)
Irregular channel normal depth above invert elev. =   0.512(Ft.)
Average velocity of channel(s) =   5.105(Ft/s)

Sub-Channel No. 1 Critical depth =      0.645(Ft.)
  '     '       '     Critical flow top width =     38.672(Ft.)
  '     '       '     Critical flow velocity=    3.227(Ft/s)
  '     '       '     Critical flow area =     12.463(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      2.742(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.768
Subarea runoff =     35.022(CFS) for   18.000(Ac.)
```

```
Total runoff =     52.616(CFS)
Effective area this stream =       25.00(Ac.)
Total Study Area (Main Stream No. 1) =      679.53(Ac.)
Area averaged Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      618.000 to Point/Station       90.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1033.000(Ft.)
Downstream point/station elevation =  1025.000(Ft.)
Pipe length  =   420.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    52.616(CFS)
Given pipe size =     48.00(In.)
Calculated individual pipe flow  =    52.616(CFS)
Normal flow depth in pipe =   16.88(In.)
Flow top width inside pipe =   45.84(In.)
Critical Depth =   26.14(In.)
Pipe flow velocity =     13.33(Ft/s)
Travel time through pipe =    0.53 min.
Time of concentration (TC) =    13.56 min.


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Process from Point/Station       90.000 to Point/Station       90.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =     25.000(Ac.)
Runoff from this stream =     52.616(CFS)
Time of concentration =   13.56 min.
Rainfall intensity =     2.678(In/Hr)
Area averaged loss rate (Fm) =    0.4035(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


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Process from Point/Station      619.000 to Point/Station      620.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1056.400(Ft.)
Bottom (of initial area) elevation =  1051.400(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.275(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.755
Subarea runoff =     10.306(CFS)
Total initial stream area =        6.000(Ac.)
Pervious area fraction = 0.500
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Initial area Fm value =    0.367(In/Hr)


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Process from Point/Station      620.000 to Point/Station      621.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1051.400(Ft.)
End of street segment elevation =  1046.000(Ft.)
Length of street segment  =  1070.000(Ft.)
Height of curb above gutter flowline  =    8.0(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) =   0.083
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 =     15.458(CFS)
Depth of flow =   0.461(Ft.), Average velocity =   2.261(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  18.293(Ft.)
Flow velocity =   2.26(Ft/s)
Travel time =    7.89 min.     TC =   25.67  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Rainfall intensity =      1.826(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.719
Subarea runoff =      5.450(CFS) for    6.000(Ac.)
Total runoff =     15.755(CFS)
Effective area this stream =       12.00(Ac.)
Total Study Area (Main Stream No. 1) =      691.53(Ac.)
Area averaged Fm value =    0.367(In/Hr)
Street flow at end of street =     15.755(CFS)
Half street flow at end of street =      7.878(CFS)
Depth of flow =   0.464(Ft.), Average velocity =   2.272(Ft/s)
Flow width (from curb towards crown)=  18.428(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      621.000 to Point/Station      621.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 4
Stream flow area =     12.000(Ac.)
Runoff from this stream =     15.755(CFS)
Time of concentration =   25.67 min.
Rainfall intensity =     1.826(In/Hr)
Area averaged loss rate (Fm) =    0.3670(In/Hr)
```

```
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

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


1      1522.640      13.98                2.629
2       137.800      21.51                2.030
3        52.616      13.56                2.678
4        15.755      25.67                1.826
Qmax(1) =
          1.000 *     1.000 *  1522.640) +
          1.317 *     0.650 *   137.800) +
          0.978 *     1.000 *    52.616) +
          1.550 *     0.545 *    15.755) + =     1705.428
Qmax(2) =
          0.747 *     1.000 *  1522.640) +
          1.000 *     1.000 *   137.800) +
          0.715 *     1.000 *    52.616) +
          1.140 *     0.838 *    15.755) + =     1327.290
Qmax(3) =
          1.021 *     0.970 *  1522.640) +
          1.343 *     0.630 *   137.800) +
          1.000 *     1.000 *    52.616) +
          1.584 *     0.528 *    15.755) + =     1689.602
Qmax(4) =
          0.660 *     1.000 *  1522.640) +
          0.892 *     1.000 *   137.800) +
          0.625 *     1.000 *    52.616) +
          1.000 *     1.000 *    15.755) + =     1176.449

Total of 4 streams to confluence:
Flow rates before confluence point:
    1522.640     137.800      52.616      15.755
Maximum flow rates at confluence using above data:
     1705.428     1327.290     1689.602     1176.449
Area of streams before confluence:
      577.910       76.620       25.000       12.000
Effective area values after confluence:
      659.260      689.583      640.042      691.530
Results of confluence:
Total flow rate =   1705.428(CFS)
Time of concentration =    13.985 min.
Effective stream area after confluence =     659.260(Ac.)
Stream Area average Pervious fraction(Ap) =  0.467
Stream Area average soil loss rate(Fm) =     0.260(In/Hr)
Study area (this main stream) =     691.53(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       90.000 to Point/Station       91.000
**** IMPROVED CHANNEL TRAVEL TIME ****

------------------------------------------------------------------------------
Covered channel
Upstream point elevation =  1022.300(Ft.)
Downstream point elevation =  1013.100(Ft.)
Channel length thru subarea  =  1320.000(Ft.)
Channel base width       =   14.000(Ft.)
Slope or 'Z' of left channel bank =   0.000
Slope or 'Z' of right channel bank =   0.000
```

```
Manning's 'N'    = 0.015
Maximum depth of channel  =    9.000(Ft.)
Flow(q) thru subarea =   1705.428(CFS)
Depth of flow =   6.539(Ft.), Average velocity =  18.630(Ft/s)
Channel flow top width =   14.000(Ft.)
Flow Velocity =   18.63(Ft/s)
Travel time  =    1.18 min.
Time of concentration =   15.17 min.
Critical depth =      7.750(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       91.000 to Point/Station       91.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    659.260(Ac.)
Runoff from this stream =   1705.428(CFS)
Time of concentration =   15.17 min.
Rainfall intensity =     2.504(In/Hr)
Area averaged loss rate (Fm) =    0.2599(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4667


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       91.000 to Point/Station       91.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------------
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 53.21
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.385(In/Hr)
Rainfall intensity =      1.966(In/Hr) for a    25.0 year storm
User specified values are as follows:
TC =  22.70 min.  Rain intensity =       1.97(In/Hr)
Total area this stream =        75.27(Ac.)
Total Study Area (Main Stream No. 1) =      766.80(Ac.)
Total runoff =    110.85(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       91.000 to Point/Station       91.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     75.270(Ac.)
Runoff from this stream =    110.850(CFS)
Time of concentration =   22.70 min.
Rainfall intensity =     1.966(In/Hr)
Area averaged loss rate (Fm) =    0.3850(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      638.000 to Point/Station      639.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
```

```
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1900.000(Ft.)
Bottom (of initial area) elevation =  1540.000(Ft.)
Difference in elevation =   360.000(Ft.)
Slope =    0.36000  s(%)=      36.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.207 min.
Rainfall intensity =      3.175(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.786
Subarea runoff =     24.948(CFS)
Total initial stream area =       10.000(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      639.000 to Point/Station      640.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     49.896(CFS)
Depth of flow =   0.772(Ft.), Average velocity =  16.729(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              20.00
      2            100.00               0.00
      3            200.00              20.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =     49.896(CFS)
  '      '    flow top width =      7.724(Ft.)
  '      '    velocity=   16.729(Ft/s)
  '      '    area =      2.983(Sq.Ft)
  '      '    Froude number =     4.744

Upstream point elevation =  1540.000(Ft.)
Downstream point elevation =  1200.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    0.60 min.
Time of concentration =   10.80 min.
Depth of flow =   0.772(Ft.)
Average velocity =  16.729(Ft/s)
Total irregular channel flow =    49.896(CFS)
Irregular channel normal depth above invert elev. =   0.772(Ft.)
Average velocity of channel(s) =  16.729(Ft/s)

Sub-Channel No. 1 Critical depth =      1.438(Ft.)
  '      '       '     Critical flow top width =     14.375(Ft.)
  '      '       '     Critical flow velocity=    4.829(Ft/s)
  '      '       '     Critical flow area =     10.332(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
```

```
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      3.069(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.782
Subarea runoff =     47.017(CFS) for   20.000(Ac.)
Total runoff =     71.965(CFS)
Effective area this stream =       30.00(Ac.)
Total Study Area (Main Stream No. 1) =      796.80(Ac.)
Area averaged Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      640.000 to Point/Station      641.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    122.341(CFS)
Depth of flow =   0.624(Ft.), Average velocity =   6.279(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              4.00
      2            200.00              0.00
      3            400.00              4.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------------
Sub-Channel flow  =    122.341(CFS)
  '     '    flow top width =     62.424(Ft.)
  '     '    velocity=    6.279(Ft/s)
  '     '    area =     19.484(Sq.Ft)
  '     '    Froude number =     1.981

Upstream point elevation =  1200.000(Ft.)
Downstream point elevation =  1045.000(Ft.)
Flow length =  1500.000(Ft.)
Travel time  =    3.98 min.
Time of concentration =   14.79 min.
Depth of flow =   0.624(Ft.)
Average velocity =   6.279(Ft/s)
Total irregular channel flow =   122.341(CFS)
Irregular channel normal depth above invert elev. =   0.624(Ft.)
Average velocity of channel(s) =   6.279(Ft/s)

Sub-Channel No. 1 Critical depth =      0.820(Ft.)
  '     '       '     Critical flow top width =     82.031(Ft.)
  '     '       '     Critical flow velocity=    3.636(Ft/s)
  '     '       '     Critical flow area =     33.646(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.404(In/Hr)
Rainfall intensity =      2.542(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.757
```

```
Subarea runoff =     66.631(CFS) for   42.000(Ac.)
Total runoff =    138.596(CFS)
Effective area this stream =       72.00(Ac.)
Total Study Area (Main Stream No. 1) =      838.80(Ac.)
Area averaged Fm value =    0.404(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      641.000 to Point/Station       91.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1035.000(Ft.)
Downstream point/station elevation =  1015.400(Ft.)
Pipe length  =   450.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   138.596(CFS)
Given pipe size =     42.00(In.)
Calculated individual pipe flow  =   138.596(CFS)
Normal flow depth in pipe =   24.91(In.)
Flow top width inside pipe =   41.26(In.)
Critical depth could not be calculated.
Pipe flow velocity =     23.31(Ft/s)
Travel time through pipe =    0.32 min.
Time of concentration (TC) =    15.11 min.


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Process from Point/Station       91.000 to Point/Station       91.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =     72.000(Ac.)
Runoff from this stream =    138.596(CFS)
Time of concentration =   15.11 min.
Rainfall intensity =     2.510(In/Hr)
Area averaged loss rate (Fm) =    0.4035(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      642.000 to Point/Station      643.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1042.000(Ft.)
Bottom (of initial area) elevation =  1037.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =     2.275(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.755
Subarea runoff =     10.306(CFS)
Total initial stream area =        6.000(Ac.)
```

```
Pervious area fraction = 0.500
Initial area Fm value =    0.367(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      643.000 to Point/Station      644.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
Top of street segment elevation =  1037.000(Ft.)
End of street segment elevation =  1031.000(Ft.)
Length of street segment  =  1200.000(Ft.)
Height of curb above gutter flowline  =    8.0(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) =   0.083
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 =     17.176(CFS)
Depth of flow =   0.477(Ft.), Average velocity =   2.313(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  19.083(Ft.)
Flow velocity =   2.31(Ft/s)
Travel time =    8.65 min.     TC =   26.44  min.
 Adding area flow to street
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)
Rainfall intensity =      1.794(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.681
Subarea runoff =      6.798(CFS) for    8.000(Ac.)
Total runoff =     17.103(CFS)
Effective area this stream =       14.00(Ac.)
Total Study Area (Main Stream No. 1) =      852.80(Ac.)
Area averaged Fm value =    0.437(In/Hr)
Street flow at end of street =     17.103(CFS)
Half street flow at end of street =      8.552(CFS)
Depth of flow =   0.476(Ft.), Average velocity =   2.311(Ft/s)
Flow width (from curb towards crown)=  19.052(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      644.000 to Point/Station      644.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 4
Stream flow area =     14.000(Ac.)
Runoff from this stream =     17.103(CFS)
Time of concentration =   26.44 min.
Rainfall intensity =     1.794(In/Hr)
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Area averaged loss rate (Fm) =    0.4366(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000

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Process from Point/Station      645.000 to Point/Station      646.000
**** 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 =  1000.000(Ft.)
Top (of initial area) elevation =  1042.000(Ft.)
Bottom (of initial area) elevation =  1037.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.275(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.707
Subarea runoff =      9.647(CFS)
Total initial stream area =        6.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.489(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      646.000 to Point/Station      647.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
-------------------------------------------------------------------------------
Top of street segment elevation =  1037.000(Ft.)
End of street segment elevation =  1031.000(Ft.)
Length of street segment  =  1200.000(Ft.)
Height of curb above gutter flowline  =    8.0(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) =   0.083
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 =     15.275(CFS)
Depth of flow =   0.460(Ft.), Average velocity =   2.247(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  18.242(Ft.)
Flow velocity =   2.25(Ft/s)
Travel time =    8.90 min.     TC =   26.69  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
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```
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.489(In/Hr)
Rainfall intensity =      1.784(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.653
Subarea runoff =      5.503(CFS) for    7.000(Ac.)
Total runoff =     15.150(CFS)
Effective area this stream =       13.00(Ac.)
Total Study Area (Main Stream No. 1) =      865.80(Ac.)
Area averaged Fm value =    0.489(In/Hr)
Street flow at end of street =     15.150(CFS)
Half street flow at end of street =      7.575(CFS)
Depth of flow =   0.459(Ft.), Average velocity =   2.242(Ft/s)
Flow width (from curb towards crown)=  18.185(Ft.)


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Process from Point/Station      647.000 to Point/Station      647.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 5
Stream flow area =     13.000(Ac.)
Runoff from this stream =     15.150(CFS)
Time of concentration =   26.69 min.
Rainfall intensity =     1.784(In/Hr)
Area averaged loss rate (Fm) =    0.4889(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

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

1      1705.428      15.17                2.504
2       110.850      22.70                1.966
3       138.596      15.11                2.510
4        17.103      26.44                1.794
5        15.150      26.69                1.784
Qmax(1) =
          1.000 *     1.000 *  1705.428) +
          1.340 *     0.668 *   110.850) +
          0.997 *     1.000 *   138.596) +
          1.523 *     0.574 *    17.103) +
          1.556 *     0.568 *    15.150) + =     1971.261
Qmax(2) =
          0.760 *     1.000 *  1705.428) +
          1.000 *     1.000 *   110.850) +
          0.742 *     1.000 *   138.596) +
          1.127 *     0.859 *    17.103) +
          1.141 *     0.850 *    15.150) + =     1541.286
Qmax(3) =
          1.003 *     0.996 *  1705.428) +
          1.344 *     0.666 *   110.850) +
          1.000 *     1.000 *   138.596) +
          1.527 *     0.571 *    17.103) +
          1.561 *     0.566 *    15.150) + =     1969.356
Qmax(4) =
          0.684 *     1.000 *  1705.428) +
          0.891 *     1.000 *   110.850) +
```

```
          0.660 *    1.000 *   138.596) +
          1.000 *    1.000 *    17.103) +
          1.008 *    0.990 *    15.150) + =    1388.419
Qmax(5) =
          0.679 *    1.000 *  1705.428) +
          0.885 *    1.000 *   110.850) +
          0.655 *    1.000 *   138.596) +
          0.992 *    1.000 *    17.103) +
          1.000 *    1.000 *    15.150) + =    1379.108

Total of 5 streams to confluence:
Flow rates before confluence point:
    1705.428     110.850     138.596      17.103      15.150
Maximum flow rates at confluence using above data:
     1971.261     1541.286     1969.356     1388.419     1379.108
Area of streams before confluence:
      659.260       75.270       72.000       14.000       13.000
Effective area values after confluence:
      796.965      829.608      794.213      833.407      833.530
Results of confluence:
Total flow rate =   1971.261(CFS)
Time of concentration =    15.166 min.
Effective stream area after confluence =    796.965(Ac.)
Stream Area average Pervious fraction(Ap) =  0.517
Stream Area average soil loss rate(Fm) =    0.290(In/Hr)
Study area (this main stream) =     833.53(Ac.)


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Process from Point/Station       91.000 to Point/Station       92.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Covered channel
Upstream point elevation =  1013.100(Ft.)
Downstream point elevation =  1006.400(Ft.)
Channel length thru subarea  =  1340.000(Ft.)
Channel base width       =   14.000(Ft.)
Slope or 'Z' of left channel bank =   0.000
Slope or 'Z' of right channel bank =   0.000
Manning's 'N'    = 0.013
Maximum depth of channel  =    9.000(Ft.)
Flow(q) thru subarea =   1971.261(CFS)
Depth of flow =   7.415(Ft.), Average velocity =  18.989(Ft/s)
Channel flow top width =   14.000(Ft.)
Flow Velocity =   18.99(Ft/s)
Travel time  =    1.18 min.
Time of concentration =   16.34 min.
Critical depth =      8.500(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       92.000 to Point/Station       92.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    796.965(Ac.)
Runoff from this stream =   1971.261(CFS)
Time of concentration =   16.34 min.
Rainfall intensity =     2.394(In/Hr)
Area averaged loss rate (Fm) =    0.2902(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5169
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      650.000 to Point/Station      651.000
**** 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 =  1000.000(Ft.)
Top (of initial area) elevation =  1040.300(Ft.)
Bottom (of initial area) elevation =  1033.600(Ft.)
Difference in elevation =     6.700(Ft.)
Slope =    0.00670  s(%)=       0.67
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   16.778 min.
Rainfall intensity =      2.357(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.713
Subarea runoff =      8.405(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.489(In/Hr)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      651.000 to Point/Station      652.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1033.600(Ft.)
End of street segment elevation =  1031.400(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(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) =   0.083
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 =     12.608(CFS)
Depth of flow =   0.416(Ft.), Average velocity =   2.388(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  16.025(Ft.)
Flow velocity =   2.39(Ft/s)
Travel time =    2.30 min.     TC =   19.08  min.
 Adding area flow to street
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)
Rainfall intensity =      2.182(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.698
Subarea runoff =      6.830(CFS) for    5.000(Ac.)
Total runoff =     15.235(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =      875.80(Ac.)
Area averaged Fm value =    0.489(In/Hr)
Street flow at end of street =     15.235(CFS)
Half street flow at end of street =      7.618(CFS)
Depth of flow =   0.440(Ft.), Average velocity =   2.502(Ft/s)
Flow width (from curb towards crown)=  17.242(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      652.000 to Point/Station      653.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1031.400(Ft.)
End of street segment elevation =  1026.000(Ft.)
Length of street segment  =   750.000(Ft.)
Height of curb above gutter flowline  =    8.0(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) =   0.083
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 =     23.615(CFS)
Depth of flow =   0.497(Ft.), Average velocity =   2.877(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 =    4.35 min.     TC =   23.43  min.
 Adding area flow to street
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)
Rainfall intensity =      1.929(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.672
Subarea runoff =     11.982(CFS) for   11.000(Ac.)
Total runoff =     27.218(CFS)
Effective area this stream =       21.00(Ac.)
Total Study Area (Main Stream No. 1) =      886.80(Ac.)
Area averaged Fm value =    0.489(In/Hr)
Street flow at end of street =     27.218(CFS)
Half street flow at end of street =     13.609(CFS)
```

```
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   10.00(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      653.000 to Point/Station      654.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
Top of street segment elevation =  1026.000(Ft.)
End of street segment elevation =  1023.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  13.000(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 =     34.346(CFS)
Depth of flow =   0.767(Ft.), Average velocity =   2.963(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    4.99(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  33.576(Ft.)
Flow velocity =   2.96(Ft/s)
Travel time =    3.71 min.     TC =   27.14  min.
 Adding area flow to street
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)
Rainfall intensity =      1.766(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.651
Subarea runoff =      9.563(CFS) for   11.000(Ac.)
Total runoff =     36.781(CFS)
Effective area this stream =       32.00(Ac.)
Total Study Area (Main Stream No. 1) =      897.80(Ac.)
Area averaged Fm value =    0.489(In/Hr)
Street flow at end of street =     36.781(CFS)
Half street flow at end of street =     36.781(CFS)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =   13.42(Ft.)
Flow width (from curb towards crown)=  42.000(Ft.)


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Process from Point/Station      654.000 to Point/Station      654.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
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```
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     32.000(Ac.)
Runoff from this stream =     36.781(CFS)
Time of concentration =   27.14 min.
Rainfall intensity =     1.766(In/Hr)
Area averaged loss rate (Fm) =    0.4889(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

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


1     1971.261     16.34                2.394
2       36.781     27.14                1.766
Qmax(1) =
          1.000 *    1.000 *  1971.261) +
          1.492 *    0.602 *    36.781) + =    2004.303
Qmax(2) =
          0.701 *    1.000 *  1971.261) +
          1.000 *    1.000 *    36.781) + =    1419.449

Total of 2 streams to confluence:
Flow rates before confluence point:
    1971.261      36.781
Maximum flow rates at confluence using above data:
     2004.303     1419.449
Area of streams before confluence:
      796.965       32.000
Effective area values after confluence:
      816.234      828.965
Results of confluence:
Total flow rate =   2004.303(CFS)
Time of concentration =    16.342 min.
Effective stream area after confluence =    816.234(Ac.)
Stream Area average Pervious fraction(Ap) =  0.516
Stream Area average soil loss rate(Fm) =    0.298(In/Hr)
Study area (this main stream) =     828.97(Ac.)


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Process from Point/Station       92.000 to Point/Station       93.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Covered channel
Upstream point elevation =  1006.400(Ft.)
Downstream point elevation =  1005.500(Ft.)
Channel length thru subarea  =   450.000(Ft.)
Channel base width       =   14.000(Ft.)
Slope or 'Z' of left channel bank =   0.000
Slope or 'Z' of right channel bank =   0.000
Manning's 'N'    = 0.015
Maximum depth of channel  =    9.000(Ft.)
Flow(q) thru subarea =   2004.303(CFS)
Pressure flow condition in covered channel:
Wetted perimeter =   46.00(Ft.)  Flow area =  126.00(Sq.Ft)
Hydraulic grade line required at box inlet =      4.505(Ft.)
Friction loss =      5.405(Ft.)
Minor Friction loss =      0.000(Ft.)   K-Factor =  0.000
Flow Velocity =   15.91(Ft/s)
Travel time  =    0.47 min.
```

Time of concentration = 23.17 min.
End of computations, Total Study Area = 897.80 (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) = 0.514
Area averaged SCS curve number = 64.7

LINE "DZ-6"

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
Rational Hydrology Study Date: 01/13/05

FONTANA / LINE DZ-6 HYDROLOGY
25 YEAR STORM
JN 04339

Hall & Forman, Inc. - S/N 950

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

Rational hydrology study storm event year is 25.0
10 Year storm 1 hour rainfall = 0.930(In.)
100 Year storm 1 hour rainfall = 1.350(In.)
Computed rainfall intensity:
Storm year = 25.00 1 hour rainfall = 1.097 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

++
Process from Point/Station 714.000 to Point/Station 715.000
**** 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 = 1000.000(Ft.)
Top (of initial area) elevation = 1104.000(Ft.)
Bottom (of initial area) elevation = 1092.000(Ft.)
Difference in elevation = 12.000(Ft.)
Slope = 0.01200 s(%)= 1.20
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.669 min.
Rainfall intensity = 2.930(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff = 17.846(CFS)
Total initial stream area = 7.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.098(In/Hr)

++
Process from Point/Station 715.000 to Point/Station 716.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1092.000(Ft.)
End of street segment elevation = 1089.000(Ft.)
Length of street segment = 800.000(Ft.)

```
Height of curb above gutter flowline  =    8.0(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 =     31.867(CFS)
Depth of flow =   0.591(Ft.), Average velocity =   2.662(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 =   2.66(Ft/s)
Travel time =    5.01 min.     TC =   16.68  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 =      2.365(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.863
Subarea runoff =     18.885(CFS) for   11.000(Ac.)
Total runoff =     36.731(CFS)
Effective area this stream =       18.00(Ac.)
Total Study Area (Main Stream No. 1) =       18.00(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Street flow at end of street =     36.731(CFS)
Half street flow at end of street =     18.366(CFS)
Depth of flow =   0.618(Ft.), Average velocity =   2.816(Ft/s)
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      716.000 to Point/Station      717.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1089.000(Ft.)
End of street segment elevation =  1081.500(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(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 [1] side(s) of the street
Distance from curb to property line  =  13.000(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
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```
 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 =     57.137(CFS)
Depth of flow =   0.780(Ft.), Average velocity =   4.717(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    5.65(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  34.236(Ft.)
Flow velocity =   4.72(Ft/s)
Travel time =    2.33 min.     TC =   19.01  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 =      2.187(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.860
Subarea runoff =     34.704(CFS) for   20.000(Ac.)
Total runoff =     71.435(CFS)
Effective area this stream =       38.00(Ac.)
Total Study Area (Main Stream No. 1) =       38.00(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Street flow at end of street =     71.435(CFS)
Half street flow at end of street =     71.435(CFS)
Depth of flow =   0.838(Ft.), Average velocity =   4.888(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    8.58(Ft.)
Flow width (from curb towards crown)=  37.160(Ft.)


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Process from Point/Station      717.000 to Point/Station       33.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1075.000(Ft.)
Downstream point/station elevation =  1061.000(Ft.)
Pipe length  =   990.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    71.435(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =    71.435(CFS)
Normal flow depth in pipe =   26.72(In.)
Flow top width inside pipe =   31.49(In.)
Critical Depth =   32.12(In.)
Pipe flow velocity =     12.70(Ft/s)
Travel time through pipe =    1.30 min.
Time of concentration (TC) =    20.31 min.


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Process from Point/Station       33.000 to Point/Station       33.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     38.000(Ac.)
Runoff from this stream =     71.435(CFS)
Time of concentration =   20.31 min.
Rainfall intensity =     2.102(In/Hr)
```

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Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000

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Process from Point/Station      718.000 to Point/Station      719.000
**** 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 =  1000.000(Ft.)
Top (of initial area) elevation =  1082.000(Ft.)
Bottom (of initial area) elevation =  1075.000(Ft.)
Difference in elevation =     7.000(Ft.)
Slope =    0.00700  s(%)=       0.70
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.997 min.
Rainfall intensity =      2.747(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.868
Subarea runoff =     11.921(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)

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Process from Point/Station      719.000 to Point/Station      720.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1075.000(Ft.)
End of street segment elevation =  1073.300(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     17.881(CFS)
Depth of flow =   0.480(Ft.), Average velocity =   2.363(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  19.269(Ft.)
Flow velocity =   2.36(Ft/s)
Travel time =    2.33 min.     TC =   15.33  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
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```
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Rainfall intensity =      2.488(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.865
Subarea runoff =      9.594(CFS) for    5.000(Ac.)
Total runoff =     21.515(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =       48.00(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Street flow at end of street =     21.515(CFS)
Half street flow at end of street =     10.757(CFS)
Depth of flow =   0.506(Ft.), Average velocity =   2.506(Ft/s)
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      720.000 to Point/Station      721.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1073.300(Ft.)
End of street segment elevation =  1070.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     32.272(CFS)
Depth of flow =   0.568(Ft.), Average velocity =   2.918(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 =   2.92(Ft/s)
Travel time =    3.77 min.     TC =   19.10  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 =      2.181(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.860
Subarea runoff =     15.977(CFS) for   10.000(Ac.)
Total runoff =     37.492(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 1) =       58.00(Ac.)
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Area averaged Fm value =    0.098(In/Hr)
Street flow at end of street =     37.492(CFS)
Half street flow at end of street =     18.746(CFS)
Depth of flow =   0.594(Ft.), Average velocity =   3.096(Ft/s)
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      721.000 to Point/Station      722.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
Top of street segment elevation =  1070.000(Ft.)
End of street segment elevation =  1068.000(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(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 [1] side(s) of the street
Distance from curb to property line  =  13.000(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 =     46.865(CFS)
Depth of flow =   0.810(Ft.), Average velocity =   3.506(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    7.17(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  35.750(Ft.)
Flow velocity =   3.51(Ft/s)
Travel time =    1.57 min.     TC =   20.66  min.
 Adding area flow to street
CONDOMINIUM 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) = 0.3500     Max loss rate(Fm)=     0.342(In/Hr)
Rainfall intensity =      2.080(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.822
Subarea runoff =     13.822(CFS) for   10.000(Ac.)
Total runoff =     51.314(CFS)
Effective area this stream =       30.00(Ac.)
Total Study Area (Main Stream No. 1) =       68.00(Ac.)
Area averaged Fm value =    0.179(In/Hr)
Street flow at end of street =     51.314(CFS)
Half street flow at end of street =     51.314(CFS)
Depth of flow =   0.834(Ft.), Average velocity =   3.559(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    8.36(Ft.)
Flow width (from curb towards crown)=  36.941(Ft.)


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Process from Point/Station      722.000 to Point/Station      722.000
**** CONFLUENCE OF MINOR STREAMS ****
--------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     30.000(Ac.)
Runoff from this stream =     51.314(CFS)
Time of concentration =   20.66 min.
Rainfall intensity =     2.080(In/Hr)
Area averaged loss rate (Fm) =    0.1793(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1833
Summary of stream data:

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


1        71.435      20.31                2.102
2        51.314      20.66                2.080
Qmax(1) =
          1.000 *     1.000 *    71.435) +
          1.011 *     0.983 *    51.314) + =     122.445
Qmax(2) =
          0.989 *     1.000 *    71.435) +
          1.000 *     1.000 *    51.314) + =     121.976

Total of 2 streams to confluence:
Flow rates before confluence point:
      71.435      51.314
Maximum flow rates at confluence using above data:
      122.445      121.976
Area of streams before confluence:
       38.000       30.000
Effective area values after confluence:
       67.485       68.000
Results of confluence:
Total flow rate =    122.445(CFS)
Time of concentration =    20.310 min.
Effective stream area after confluence =     67.485(Ac.)
Stream Area average Pervious fraction(Ap) =  0.137
Stream Area average soil loss rate(Fm) =    0.134(In/Hr)
Study area (this main stream) =      68.00(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      33.000 to Point/Station      34.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
--------------------------------------------------------------------------
Upstream point/station elevation =  1061.000(Ft.)
Downstream point/station elevation =  1048.200(Ft.)
Pipe length  =   990.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   122.445(CFS)
Given pipe size =     39.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    14.039(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     21.764(Ft.)
 Minor friction loss =      5.074(Ft.)    K-factor =   1.50
Pipe flow velocity =     14.76(Ft/s)
Travel time through pipe =    1.12 min.
Time of concentration (TC) =    21.43 min.
```

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Process from Point/Station       34.000 to Point/Station       34.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      67.485(Ac.)
Runoff from this stream =     122.445(CFS)
Time of concentration =   21.43 min.
Rainfall intensity =      2.035(In/Hr)
Area averaged loss rate (Fm) =     0.1337(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1368


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Process from Point/Station      723.000 to Point/Station      724.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
CONDOMINIUM 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) = 0.3500     Max loss rate(Fm)=      0.342(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1072.000(Ft.)
Bottom (of initial area) elevation =  1066.600(Ft.)
Difference in elevation =      5.400(Ft.)
Slope =    0.00540  s(%)=        0.54
TC = k(0.360)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   16.212 min.
Rainfall intensity =      2.406(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.772
Subarea runoff =      9.286(CFS)
Total initial stream area =         5.000(Ac.)
Pervious area fraction = 0.350
Initial area Fm value =    0.342(In/Hr)


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Process from Point/Station      724.000 to Point/Station      725.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
Top of street segment elevation =  1066.600(Ft.)
End of street segment elevation =  1063.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     13.929(CFS)
Depth of flow =   0.441(Ft.), Average velocity =   2.270(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  17.313(Ft.)
Flow velocity =   2.27(Ft/s)
Travel time =    4.85 min.     TC =   21.06  min.
 Adding area flow to street
CONDOMINIUM 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) = 0.3500     Max loss rate(Fm)=     0.342(In/Hr)
Rainfall intensity =      2.056(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.750
Subarea runoff =      6.141(CFS) for    5.000(Ac.)
Total runoff =     15.427(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =       78.00(Ac.)
Area averaged Fm value =    0.342(In/Hr)
Street flow at end of street =     15.427(CFS)
Half street flow at end of street =      7.713(CFS)
Depth of flow =   0.455(Ft.), Average velocity =   2.327(Ft/s)
Flow width (from curb towards crown)=  18.008(Ft.)


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Process from Point/Station      725.000 to Point/Station      729.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1063.000(Ft.)
End of street segment elevation =  1056.600(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(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 [1] side(s) of the street
Distance from curb to property line  =  13.000(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 =     15.427(CFS)
Depth of flow =   0.516(Ft.), Average velocity =   3.431(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  21.037(Ft.)
Flow velocity =   3.43(Ft/s)
Travel time =    3.21 min.     TC =   24.26  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
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Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Rainfall intensity =      1.889(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.737
Subarea runoff =      0.000(CFS) for    0.000(Ac.)
Total runoff =     15.427(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =       78.00(Ac.)
Area averaged Fm value =    0.342(In/Hr)
Street flow at end of street =     15.427(CFS)
Half street flow at end of street =     15.427(CFS)
Depth of flow =   0.516(Ft.), Average velocity =   3.431(Ft/s)
Flow width (from curb towards crown)=  21.037(Ft.)


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Process from Point/Station      729.000 to Point/Station      729.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     10.000(Ac.)
Runoff from this stream =     15.427(CFS)
Time of concentration =   24.26 min.
Rainfall intensity =     1.889(In/Hr)
Area averaged loss rate (Fm) =    0.3422(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3500


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Process from Point/Station      726.000 to Point/Station      727.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
CONDOMINIUM 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) = 0.3500     Max loss rate(Fm)=     0.342(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1069.200(Ft.)
Bottom (of initial area) elevation =  1062.000(Ft.)
Difference in elevation =     7.200(Ft.)
Slope =    0.00720  s(%)=       0.72
TC = k(0.360)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   15.305 min.
Rainfall intensity =      2.490(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.776
Subarea runoff =      9.666(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.350
Initial area Fm value =    0.342(In/Hr)


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Process from Point/Station      727.000 to Point/Station      728.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1062.000(Ft.)
End of street segment elevation =  1060.000(Ft.)
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Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     14.499(CFS)
Depth of flow =   0.440(Ft.), Average velocity =   2.385(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  17.230(Ft.)
Flow velocity =   2.38(Ft/s)
Travel time =    2.31 min.     TC =   17.61  min.
 Adding area flow to street
CONDOMINIUM 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) = 0.3500     Max loss rate(Fm)=     0.342(In/Hr)
Rainfall intensity =      2.289(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.765
Subarea runoff =      7.856(CFS) for    5.000(Ac.)
Total runoff =     17.522(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =       88.00(Ac.)
Area averaged Fm value =    0.342(In/Hr)
Street flow at end of street =     17.522(CFS)
Half street flow at end of street =      8.761(CFS)
Depth of flow =   0.466(Ft.), Average velocity =   2.499(Ft/s)
Flow width (from curb towards crown)=  18.533(Ft.)


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Process from Point/Station      728.000 to Point/Station      729.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1060.000(Ft.)
End of street segment elevation =  1056.600(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(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
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 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     26.284(CFS)
Depth of flow =   0.534(Ft.), Average velocity =   2.714(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 =   2.71(Ft/s)
Travel time =    4.05 min.     TC =   21.67  min.
 Adding area flow to street
CONDOMINIUM 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) = 0.3500     Max loss rate(Fm)=     0.342(In/Hr)
Rainfall intensity =      2.022(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.748
Subarea runoff =     12.706(CFS) for   10.000(Ac.)
Total runoff =     30.229(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 1) =       98.00(Ac.)
Area averaged Fm value =    0.342(In/Hr)
Street flow at end of street =     30.229(CFS)
Half street flow at end of street =     15.114(CFS)
Depth of flow =   0.555(Ft.), Average velocity =   2.868(Ft/s)
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      729.000 to Point/Station      729.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =     20.000(Ac.)
Runoff from this stream =     30.229(CFS)
Time of concentration =   21.67 min.
Rainfall intensity =     2.022(In/Hr)
Area averaged loss rate (Fm) =    0.3422(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3500
Summary of stream data:

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


1       122.445      21.43                2.035
2        15.427      24.26                1.889
3        30.229      21.67                2.022
Qmax(1) =
          1.000 *     1.000 *   122.445) +
          1.095 *     0.883 *    15.427) +
          1.008 *     0.989 *    30.229) + =     167.493
Qmax(2) =
          0.923 *     1.000 *   122.445) +
          1.000 *     1.000 *    15.427) +
          0.921 *     1.000 *    30.229) + =     156.287
Qmax(3) =
          0.993 *     1.000 *   122.445) +
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         1.086 *    0.893 *    15.427) +
         1.000 *    1.000 *    30.229) + =     166.768

Total of 3 streams to confluence:
Flow rates before confluence point:
     122.445      15.427      30.229
Maximum flow rates at confluence using above data:
      167.493      156.287      166.768
Area of streams before confluence:
       67.485       10.000       20.000
Effective area values after confluence:
       96.097       97.485       96.414
Results of confluence:
Total flow rate =    167.493(CFS)
Time of concentration =    21.428 min.
Effective stream area after confluence =     96.097(Ac.)
Stream Area average Pervious fraction(Ap) =  0.202
Stream Area average soil loss rate(Fm) =    0.198(In/Hr)
Study area (this main stream) =      97.49(Ac.)


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Process from Point/Station       34.000 to Point/Station       35.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1048.200(Ft.)
Downstream point/station elevation =  1042.000(Ft.)
Pipe length  =   660.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   167.493(CFS)
Given pipe size =     39.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    30.445(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     27.150(Ft.)
 Minor friction loss =      9.495(Ft.)    K-factor =   1.50
Pipe flow velocity =     20.19(Ft/s)
Travel time through pipe =    0.54 min.
Time of concentration (TC) =    21.97 min.


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Process from Point/Station       35.000 to Point/Station       35.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     96.097(Ac.)
Runoff from this stream =    167.493(CFS)
Time of concentration =   21.97 min.
Rainfall intensity =     2.005(In/Hr)
Area averaged loss rate (Fm) =    0.1979(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2024


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Process from Point/Station      730.000 to Point/Station      731.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
CONDOMINIUM subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
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Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.3500     Max loss rate(Fm)=     0.257(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1063.700(Ft.)
Bottom (of initial area) elevation =  1055.800(Ft.)
Difference in elevation =     7.900(Ft.)
Slope =    0.00790  s(%)=       0.79
TC = k(0.360)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   15.024 min.
Rainfall intensity =      2.518(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.808
Subarea runoff =     10.176(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.350
Initial area Fm value =    0.257(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      731.000 to Point/Station      732.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1055.800(Ft.)
End of street segment elevation =  1053.600(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     15.264(CFS)
Depth of flow =   0.440(Ft.), Average velocity =   2.504(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  17.254(Ft.)
Flow velocity =   2.50(Ft/s)
Travel time =    2.20 min.     TC =   17.22  min.
 Adding area flow to street
CONDOMINIUM subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.3500     Max loss rate(Fm)=     0.257(In/Hr)
Rainfall intensity =      2.320(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.800
Subarea runoff =      8.394(CFS) for    5.000(Ac.)
Total runoff =     18.570(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =      108.00(Ac.)
Area averaged Fm value =    0.257(In/Hr)
```

```
Street flow at end of street =     18.570(CFS)
Half street flow at end of street =      9.285(CFS)
Depth of flow =   0.467(Ft.), Average velocity =   2.628(Ft/s)
Flow width (from curb towards crown)=  18.607(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      732.000 to Point/Station      733.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
-------------------------------------------------------------------------------
Top of street segment elevation =  1053.600(Ft.)
End of street segment elevation =  1049.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(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 [1] side(s) of the street
Distance from curb to property line  =  13.000(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 =     27.855(CFS)
Depth of flow =   0.656(Ft.), Average velocity =   3.510(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  28.045(Ft.)
Flow velocity =   3.51(Ft/s)
Travel time =    3.13 min.     TC =   20.35  min.
 Adding area flow to street
CONDOMINIUM 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) = 0.3500     Max loss rate(Fm)=     0.342(In/Hr)
Rainfall intensity =      2.099(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.772
Subarea runoff =     13.815(CFS) for   10.000(Ac.)
Total runoff =     32.385(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 1) =      118.00(Ac.)
Area averaged Fm value =    0.300(In/Hr)
Street flow at end of street =     32.385(CFS)
Half street flow at end of street =     32.385(CFS)
Depth of flow =   0.695(Ft.), Average velocity =   3.567(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    1.40(Ft.)
Flow width (from curb towards crown)=  29.981(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      733.000 to Point/Station      733.000
**** CONFLUENCE OF MINOR STREAMS ****
-------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
```

```
Stream flow area =     20.000(Ac.)
Runoff from this stream =     32.385(CFS)
Time of concentration =   20.35 min.
Rainfall intensity =     2.099(In/Hr)
Area averaged loss rate (Fm) =    0.2996(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3500
Summary of stream data:

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


1      167.493     21.97                2.005
2       32.385     20.35                2.099
Qmax(1) =
         1.000 *    1.000 *   167.493) +
         0.948 *    1.000 *    32.385) + =     198.184
Qmax(2) =
         1.052 *    0.926 *   167.493) +
         1.000 *    1.000 *    32.385) + =     195.630

Total of 2 streams to confluence:
Flow rates before confluence point:
     167.493      32.385
Maximum flow rates at confluence using above data:
      198.184      195.630
Area of streams before confluence:
       96.097       20.000
Effective area values after confluence:
      116.097      109.023
Results of confluence:
Total flow rate =    198.184(CFS)
Time of concentration =    21.972 min.
Effective stream area after confluence =    116.097(Ac.)
Stream Area average Pervious fraction(Ap) =  0.228
Stream Area average soil loss rate(Fm) =    0.215(In/Hr)
Study area (this main stream) =     116.10(Ac.)
End of computations, Total Study Area =          118.00 (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) = 0.227
Area averaged SCS curve number =  34.0
```

LINE "DZ-7"

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
Rational Hydrology Study Date: 01/13/05

FONTANA / LINE DZ-7 HYDROLOGY
25 YEAR STORM
JN 04339

Hall & Forman, Inc. - S/N 950

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

Rational hydrology study storm event year is 25.0
10 Year storm 1 hour rainfall = 0.930(In.)
100 Year storm 1 hour rainfall = 1.350(In.)
Computed rainfall intensity:
Storm year = 25.00 1 hour rainfall = 1.097 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

++
Process from Point/Station 800.000 to Point/Station 801.000
**** 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 = 1000.000(Ft.)
Top (of initial area) elevation = 1098.000(Ft.)
Bottom (of initial area) elevation = 1088.000(Ft.)
Difference in elevation = 10.000(Ft.)
Slope = 0.01000 s(%)= 1.00
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 12.102 min.
Rainfall intensity = 2.867(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.869
Subarea runoff = 14.954(CFS)
Total initial stream area = 6.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.098(In/Hr)

++
Process from Point/Station 801.000 to Point/Station 802.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1088.000(Ft.)
End of street segment elevation = 1081.000(Ft.)
Length of street segment = 820.000(Ft.)

```
Height of curb above gutter flowline  =    8.0(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 =     27.415(CFS)
Depth of flow =   0.505(Ft.), Average velocity =   3.213(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 =   3.21(Ft/s)
Travel time =    4.25 min.     TC =   16.36  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 =      2.393(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.863
Subarea runoff =     18.097(CFS) for   10.000(Ac.)
Total runoff =     33.051(CFS)
Effective area this stream =       16.00(Ac.)
Total Study Area (Main Stream No. 1) =       16.00(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Street flow at end of street =     33.051(CFS)
Half street flow at end of street =     16.526(CFS)
Depth of flow =   0.530(Ft.), Average velocity =   3.461(Ft/s)
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      802.000 to Point/Station      803.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1081.000(Ft.)
End of street segment elevation =  1075.000(Ft.)
Length of street segment  =   620.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(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 [1] side(s) of the street
Distance from curb to property line  =  13.000(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
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 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 =     53.708(CFS)
Depth of flow =   0.785(Ft.), Average velocity =   4.365(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    5.89(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  34.476(Ft.)
Flow velocity =   4.37(Ft/s)
Travel time =    2.37 min.     TC =   18.72  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 =      2.207(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.860
Subarea runoff =     35.274(CFS) for   20.000(Ac.)
Total runoff =     68.325(CFS)
Effective area this stream =       36.00(Ac.)
Total Study Area (Main Stream No. 1) =       36.00(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Street flow at end of street =     68.325(CFS)
Half street flow at end of street =     68.325(CFS)
Depth of flow =   0.848(Ft.), Average velocity =   4.539(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    9.05(Ft.)
Flow width (from curb towards crown)=  37.634(Ft.)


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Process from Point/Station      803.000 to Point/Station       36.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1069.000(Ft.)
Downstream point/station elevation =  1054.000(Ft.)
Pipe length =   990.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow =    68.325(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow =    68.325(CFS)
Normal flow depth in pipe =   25.08(In.)
Flow top width inside pipe =   33.10(In.)
Critical Depth =   31.61(In.)
Pipe flow velocity =     12.99(Ft/s)
Travel time through pipe =    1.27 min.
Time of concentration (TC) =    19.99 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       36.000 to Point/Station       36.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     36.000(Ac.)
Runoff from this stream =     68.325(CFS)
Time of concentration =   19.99 min.
Rainfall intensity =     2.121(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      804.000 to Point/Station      805.000
**** 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 =  1000.000(Ft.)
Top (of initial area) elevation =  1081.500(Ft.)
Bottom (of initial area) elevation =  1071.000(Ft.)
Difference in elevation =    10.500(Ft.)
Slope =    0.01050  s(%)=       1.05
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.985 min.
Rainfall intensity =      2.884(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.869
Subarea runoff =     12.537(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


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Process from Point/Station      805.000 to Point/Station      806.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
-------------------------------------------------------------------------------
Top of street segment elevation =  1071.000(Ft.)
End of street segment elevation =  1069.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     25.074(CFS)
Depth of flow =   0.568(Ft.), Average velocity =   2.270(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 =   2.27(Ft/s)
Travel time =    4.85 min.     TC =   16.83  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 =      2.352(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.863
Subarea runoff =     17.897(CFS) for   10.000(Ac.)
Total runoff =     30.435(CFS)
Effective area this stream =       15.00(Ac.)
Total Study Area (Main Stream No. 1) =       51.00(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Street flow at end of street =     30.435(CFS)
Half street flow at end of street =     15.217(CFS)
Depth of flow =   0.602(Ft.), Average velocity =   2.451(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      806.000 to Point/Station      807.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1069.000(Ft.)
End of street segment elevation =  1065.000(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     35.507(CFS)
Depth of flow =   0.516(Ft.), Average velocity =   3.958(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 =   3.96(Ft/s)
Travel time =    1.39 min.     TC =   18.22  min.
 Adding area flow to street
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)
Rainfall intensity =      2.243(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.822
Subarea runoff =      6.417(CFS) for    5.000(Ac.)
Total runoff =     36.851(CFS)
Effective area this stream =       20.00(Ac.)
```

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Total Study Area (Main Stream No. 1) =       56.00(Ac.)
Area averaged Fm value =    0.196(In/Hr)
Street flow at end of street =     36.851(CFS)
Half street flow at end of street =     18.426(CFS)
Depth of flow =   0.521(Ft.), Average velocity =   4.016(Ft/s)
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      807.000 to Point/Station      808.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
Top of street segment elevation =  1065.000(Ft.)
End of street segment elevation =  1060.000(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(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 [1] side(s) of the street
Distance from curb to property line  =  13.000(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 =     46.064(CFS)
Depth of flow =   0.685(Ft.), Average velocity =   5.249(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    0.91(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  29.489(Ft.)
Flow velocity =   5.25(Ft/s)
Travel time =    1.05 min.     TC =   19.27  min.
 Adding area flow to street
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)
Rainfall intensity =      2.169(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.778
Subarea runoff =     13.788(CFS) for   10.000(Ac.)
Total runoff =     50.639(CFS)
Effective area this stream =       30.00(Ac.)
Total Study Area (Main Stream No. 1) =       66.00(Ac.)
Area averaged Fm value =    0.293(In/Hr)
Street flow at end of street =     50.639(CFS)
Half street flow at end of street =     50.639(CFS)
Depth of flow =   0.710(Ft.), Average velocity =   5.281(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    2.19(Ft.)
Flow width (from curb towards crown)=  30.772(Ft.)
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Process from Point/Station      808.000 to Point/Station      808.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     30.000(Ac.)
Runoff from this stream =     50.639(CFS)
Time of concentration =   19.27 min.
Rainfall intensity =     2.169(In/Hr)
Area averaged loss rate (Fm) =    0.2933(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3000
Summary of stream data:

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


1        68.325     19.99                2.121
2        50.639     19.27                2.169
Qmax(1) =
          1.000 *    1.000 *    68.325) +
          0.975 *    1.000 *    50.639) + =     117.682
Qmax(2) =
          1.023 *    0.964 *    68.325) +
          1.000 *    1.000 *    50.639) + =     118.035

Total of 2 streams to confluence:
Flow rates before confluence point:
      68.325      50.639
Maximum flow rates at confluence using above data:
      117.682      118.035
Area of streams before confluence:
       36.000       30.000
Effective area values after confluence:
       66.000       64.696
Results of confluence:
Total flow rate =    118.035(CFS)
Time of concentration =    19.269 min.
Effective stream area after confluence =     64.696(Ac.)
Stream Area average Pervious fraction(Ap) =  0.191
Stream Area average soil loss rate(Fm) =    0.187(In/Hr)
Study area (this main stream) =      66.00(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       36.000 to Point/Station       37.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1054.000(Ft.)
Downstream point/station elevation =  1043.500(Ft.)
Pipe length  =   990.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   118.035(CFS)
Given pipe size =     42.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     6.627(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     13.622(Ft.)
 Minor friction loss =      3.506(Ft.)    K-factor =   1.50
Pipe flow velocity =     12.27(Ft/s)
Travel time through pipe =    1.34 min.
Time of concentration (TC) =    20.61 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       37.000 to Point/Station       37.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     64.696(Ac.)
Runoff from this stream =    118.035(CFS)
Time of concentration =   20.61 min.
Rainfall intensity =     2.083(In/Hr)
Area averaged loss rate (Fm) =    0.1867(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1909


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      809.000 to Point/Station      810.000
**** 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 =  1000.000(Ft.)
Top (of initial area) elevation =  1068.000(Ft.)
Bottom (of initial area) elevation =  1061.000(Ft.)
Difference in elevation =     7.000(Ft.)
Slope =    0.00700  s(%)=       0.70
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   16.631 min.
Rainfall intensity =      2.369(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.714
Subarea runoff =      8.461(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.489(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      810.000 to Point/Station      811.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1061.000(Ft.)
End of street segment elevation =  1057.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     12.692(CFS)
Depth of flow =   0.422(Ft.), Average velocity =   2.308(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  16.366(Ft.)
Flow velocity =   2.31(Ft/s)
Travel time =    4.77 min.     TC =   21.40  min.
 Adding area flow to street
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)
Rainfall intensity =      2.037(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.684
Subarea runoff =      5.469(CFS) for    5.000(Ac.)
Total runoff =     13.930(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =       76.00(Ac.)
Area averaged Fm value =    0.489(In/Hr)
Street flow at end of street =     13.930(CFS)
Half street flow at end of street =      6.965(CFS)
Depth of flow =   0.434(Ft.), Average velocity =   2.361(Ft/s)
Flow width (from curb towards crown)=  16.965(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      811.000 to Point/Station      812.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1057.000(Ft.)
End of street segment elevation =  1051.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(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 [1] side(s) of the street
Distance from curb to property line  =  13.000(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 =     27.861(CFS)
Depth of flow =   0.628(Ft.), Average velocity =   3.878(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  26.670(Ft.)
Flow velocity =   3.88(Ft/s)
Travel time =    2.84 min.     TC =   24.23  min.
 Adding area flow to street
SCHOOL 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) = 0.6000     Max loss rate(Fm)=     0.587(In/Hr)
Rainfall intensity =      1.890(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.636
Subarea runoff =     22.143(CFS) for   20.000(Ac.)
Total runoff =     36.073(CFS)
Effective area this stream =       30.00(Ac.)
Total Study Area (Main Stream No. 1) =       96.00(Ac.)
Area averaged Fm value =    0.554(In/Hr)
Street flow at end of street =     36.073(CFS)
Half street flow at end of street =     36.073(CFS)
Depth of flow =   0.688(Ft.), Average velocity =   4.068(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    1.06(Ft.)
Flow width (from curb towards crown)=  29.640(Ft.)


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Process from Point/Station      812.000 to Point/Station      812.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     30.000(Ac.)
Runoff from this stream =     36.073(CFS)
Time of concentration =   24.23 min.
Rainfall intensity =     1.890(In/Hr)
Area averaged loss rate (Fm) =    0.5541(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5667
Summary of stream data:

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


1       118.035      20.61                2.083
2        36.073      24.23                1.890
Qmax(1) =
          1.000 *     1.000 *   118.035) +
          1.144 *     0.851 *    36.073) + =     153.145
Qmax(2) =
          0.898 *     1.000 *   118.035) +
          1.000 *     1.000 *    36.073) + =     142.114

Total of 2 streams to confluence:
Flow rates before confluence point:
     118.035      36.073
Maximum flow rates at confluence using above data:
      153.145      142.114
Area of streams before confluence:
       64.696       30.000
Effective area values after confluence:
       90.215       94.696
Results of confluence:
Total flow rate =    153.145(CFS)
Time of concentration =    20.614 min.
Effective stream area after confluence =     90.215(Ac.)
Stream Area average Pervious fraction(Ap) =  0.310
Stream Area average soil loss rate(Fm) =    0.303(In/Hr)
Study area (this main stream) =      94.70(Ac.)
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Process from Point/Station       37.000 to Point/Station       38.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1043.500(Ft.)
Downstream point/station elevation =  1038.000(Ft.)
Pipe length  =   660.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   153.145(CFS)
Given pipe size =     42.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    15.689(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     15.287(Ft.)
 Minor friction loss =      5.901(Ft.)    K-factor =   1.50
Pipe flow velocity =     15.92(Ft/s)
Travel time through pipe =    0.69 min.
Time of concentration (TC) =    21.31 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       38.000 to Point/Station       38.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     90.215(Ac.)
Runoff from this stream =    153.145(CFS)
Time of concentration =   21.31 min.
Rainfall intensity =     2.042(In/Hr)
Area averaged loss rate (Fm) =    0.3031(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3099


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      813.000 to Point/Station      814.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
CONDOMINIUM 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) = 0.3500     Max loss rate(Fm)=     0.342(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1056.600(Ft.)
Bottom (of initial area) elevation =  1048.500(Ft.)
Difference in elevation =     8.100(Ft.)
Slope =    0.00810  s(%)=       0.81
TC = k(0.360)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.949 min.
Rainfall intensity =      2.526(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.778
Subarea runoff =      9.826(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.350
Initial area Fm value =    0.342(In/Hr)


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Process from Point/Station      814.000 to Point/Station      815.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
Top of street segment elevation =  1048.500(Ft.)
End of street segment elevation =  1047.300(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     14.739(CFS)
Depth of flow =   0.478(Ft.), Average velocity =   1.976(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  19.128(Ft.)
Flow velocity =   1.98(Ft/s)
Travel time =    2.78 min.     TC =   17.73  min.
 Adding area flow to street
CONDOMINIUM 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) = 0.3500     Max loss rate(Fm)=     0.342(In/Hr)
Rainfall intensity =      2.280(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.765
Subarea runoff =      7.612(CFS) for    5.000(Ac.)
Total runoff =     17.438(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =      106.00(Ac.)
Area averaged Fm value =    0.342(In/Hr)
Street flow at end of street =     17.438(CFS)
Half street flow at end of street =      8.719(CFS)
Depth of flow =   0.501(Ft.), Average velocity =   2.076(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      815.000 to Point/Station      816.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
Top of street segment elevation =  1047.300(Ft.)
End of street segment elevation =  1045.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     26.156(CFS)
Depth of flow =   0.563(Ft.), Average velocity =   2.407(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 =   2.41(Ft/s)
Travel time =    4.57 min.     TC =   22.30  min.
 Adding area flow to street
CONDOMINIUM 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) = 0.3500     Max loss rate(Fm)=     0.342(In/Hr)
Rainfall intensity =      1.987(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.745
Subarea runoff =     12.164(CFS) for   10.000(Ac.)
Total runoff =     29.601(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 1) =      116.00(Ac.)
Area averaged Fm value =    0.342(In/Hr)
Street flow at end of street =     29.601(CFS)
Half street flow at end of street =     14.801(CFS)
Depth of flow =   0.584(Ft.), Average velocity =   2.528(Ft/s)
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      816.000 to Point/Station      816.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     20.000(Ac.)
Runoff from this stream =     29.601(CFS)
Time of concentration =   22.30 min.
Rainfall intensity =     1.987(In/Hr)
Area averaged loss rate (Fm) =    0.3422(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3500
Summary of stream data:

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


1      153.145     21.31              2.042
2       29.601     22.30              1.987
Qmax(1) =
         1.000 *    1.000 *   153.145) +
         1.034 *    0.955 *    29.601) + =     182.373
Qmax(2) =
         0.968 *    1.000 *   153.145) +
```

```
         1.000 *    1.000 *    29.601) + =     177.878

Total of 2 streams to confluence:
Flow rates before confluence point:
     153.145      29.601
Maximum flow rates at confluence using above data:
      182.373      177.878
Area of streams before confluence:
       90.215       20.000
Effective area values after confluence:
      109.321      110.215
Results of confluence:
Total flow rate =    182.373(CFS)
Time of concentration =    21.305 min.
Effective stream area after confluence =    109.321(Ac.)
Stream Area average Pervious fraction(Ap) =  0.317
Stream Area average soil loss rate(Fm) =    0.310(In/Hr)
Study area (this main stream) =     110.22(Ac.)
End of computations, Total Study Area =          116.00 (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) = 0.316
Area averaged SCS curve number =  32.0
```

LINE "DZ-5"

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
Rational Hydrology Study Date: 01/13/05

FONTANA / LINE DZ-5 HYDROLOGY
25 YEAR STORM
JN 04339

Hall & Forman, Inc. - S/N 950

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

Rational hydrology study storm event year is 25.0
10 Year storm 1 hour rainfall = 0.930(In.)
100 Year storm 1 hour rainfall = 1.350(In.)
Computed rainfall intensity:
Storm year = 25.00 1 hour rainfall = 1.097 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

++
Process from Point/Station 700.000 to Point/Station 701.000
**** INITIAL AREA EVALUATION ****

CONDOMINIUM 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) = 0.3500 Max loss rate(Fm)= 0.342(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 1104.000(Ft.)
Bottom (of initial area) elevation = 1096.700(Ft.)
Difference in elevation = 7.300(Ft.)
Slope = 0.00730 s(%)= 0.73
TC = k(0.360)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 15.263 min.
Rainfall intensity = 2.494(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.777
Subarea runoff = 9.685(CFS)
Total initial stream area = 5.000(Ac.)
Pervious area fraction = 0.350
Initial area Fm value = 0.342(In/Hr)

++
Process from Point/Station 701.000 to Point/Station 702.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1096.700(Ft.)
End of street segment elevation = 1095.000(Ft.)
Length of street segment = 330.000(Ft.)

```
Height of curb above gutter flowline  =    8.0(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 =     14.527(CFS)
Depth of flow =   0.451(Ft.), Average velocity =   2.244(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  17.791(Ft.)
Flow velocity =   2.24(Ft/s)
Travel time =    2.45 min.     TC =   17.71  min.
 Adding area flow to street
CONDOMINIUM 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) = 0.3500     Max loss rate(Fm)=     0.342(In/Hr)
Rainfall intensity =      2.281(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.765
Subarea runoff =      7.766(CFS) for    5.000(Ac.)
Total runoff =     17.451(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =       10.00(Ac.)
Area averaged Fm value =    0.342(In/Hr)
Street flow at end of street =     17.451(CFS)
Half street flow at end of street =      8.725(CFS)
Depth of flow =   0.477(Ft.), Average velocity =   2.348(Ft/s)
Flow width (from curb towards crown)=  19.090(Ft.)


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Process from Point/Station      702.000 to Point/Station      703.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1095.000(Ft.)
End of street segment elevation =  1092.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     26.176(CFS)
Depth of flow =   0.542(Ft.), Average velocity =   2.609(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 =   2.61(Ft/s)
Travel time =    4.22 min.     TC =   21.93  min.
 Adding area flow to street
CONDOMINIUM 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) = 0.3500     Max loss rate(Fm)=     0.342(In/Hr)
Rainfall intensity =      2.007(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.747
Subarea runoff =     12.513(CFS) for   10.000(Ac.)
Total runoff =     29.964(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 1) =       20.00(Ac.)
Area averaged Fm value =    0.342(In/Hr)
Street flow at end of street =     29.964(CFS)
Half street flow at end of street =     14.982(CFS)
Depth of flow =   0.564(Ft.), Average velocity =   2.753(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      703.000 to Point/Station      704.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1092.000(Ft.)
End of street segment elevation =  1082.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(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 [1] side(s) of the street
Distance from curb to property line  =  13.000(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 =     44.946(CFS)
Depth of flow =   0.678(Ft.), Average velocity =   5.244(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    0.56(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  29.148(Ft.)
Flow velocity =   5.24(Ft/s)
Travel time =    2.10 min.     TC =   24.03  min.
 Adding area flow to street
CONDOMINIUM 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) = 0.3500     Max loss rate(Fm)=     0.342(In/Hr)
Rainfall intensity =      1.900(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.738
Subarea runoff =     26.111(CFS) for   20.000(Ac.)
Total runoff =     56.075(CFS)
Effective area this stream =       40.00(Ac.)
Total Study Area (Main Stream No. 1) =       40.00(Ac.)
Area averaged Fm value =    0.342(In/Hr)
Street flow at end of street =     56.075(CFS)
Half street flow at end of street =     56.075(CFS)
Depth of flow =   0.737(Ft.), Average velocity =   5.334(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    3.53(Ft.)
Flow width (from curb towards crown)=  32.118(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      704.000 to Point/Station       30.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1076.000(Ft.)
Downstream point/station elevation =  1066.000(Ft.)
Pipe length  =  1000.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    56.075(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =    56.075(CFS)
Normal flow depth in pipe =   25.27(In.)
Flow top width inside pipe =   32.94(In.)
Critical Depth =   29.14(In.)
Pipe flow velocity =     10.57(Ft/s)
Travel time through pipe =    1.58 min.
Time of concentration (TC) =    25.60 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       30.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     40.000(Ac.)
Runoff from this stream =     56.075(CFS)
Time of concentration =   25.60 min.
Rainfall intensity =     1.829(In/Hr)
Area averaged loss rate (Fm) =    0.3422(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3500


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Process from Point/Station      705.000 to Point/Station      706.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
CONDOMINIUM 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) = 0.3500     Max loss rate(Fm)=     0.342(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1085.700(Ft.)
Bottom (of initial area) elevation =  1075.300(Ft.)
Difference in elevation =    10.400(Ft.)
Slope =    0.01040  s(%)=       1.04
TC = k(0.360)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.220 min.
Rainfall intensity =      2.603(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.782
Subarea runoff =     20.344(CFS)
Total initial stream area =       10.000(Ac.)
Pervious area fraction = 0.350
Initial area Fm value =    0.342(In/Hr)


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Process from Point/Station      706.000 to Point/Station      707.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
Top of street segment elevation =  1075.300(Ft.)
End of street segment elevation =  1072.000(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     27.972(CFS)
Depth of flow =   0.497(Ft.), Average velocity =   3.397(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 =   3.40(Ft/s)
Travel time =    1.62 min.     TC =   15.84  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Rainfall intensity =      2.440(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.770
Subarea runoff =     12.523(CFS) for    7.500(Ac.)
Total runoff =     32.866(CFS)
Effective area this stream =       17.50(Ac.)
Total Study Area (Main Stream No. 1) =       57.50(Ac.)
Area averaged Fm value =    0.353(In/Hr)
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Street flow at end of street =     32.866(CFS)
Half street flow at end of street =     16.433(CFS)
Depth of flow =   0.518(Ft.), Average velocity =   3.622(Ft/s)
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      707.000 to Point/Station      707.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     17.500(Ac.)
Runoff from this stream =     32.866(CFS)
Time of concentration =   15.84 min.
Rainfall intensity =     2.440(In/Hr)
Area averaged loss rate (Fm) =    0.3528(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4143
Summary of stream data:

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


1        56.075      25.60                1.829
2        32.866      15.84                2.440
Qmax(1) =
          1.000 *     1.000 *    56.075) +
          0.707 *     1.000 *    32.866) + =      79.321
Qmax(2) =
          1.411 *     0.619 *    56.075) +
          1.000 *     1.000 *    32.866) + =      81.807

Total of 2 streams to confluence:
Flow rates before confluence point:
      56.075      32.866
Maximum flow rates at confluence using above data:
       79.321       81.807
Area of streams before confluence:
       40.000       17.500
Effective area values after confluence:
       57.500       42.244
Results of confluence:
Total flow rate =     81.807(CFS)
Time of concentration =    15.839 min.
Effective stream area after confluence =     42.244(Ac.)
Stream Area average Pervious fraction(Ap) =  0.370
Stream Area average soil loss rate(Fm) =    0.345(In/Hr)
Study area (this main stream) =      57.50(Ac.)


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Process from Point/Station       30.000 to Point/Station       31.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1066.000(Ft.)
Downstream point/station elevation =  1062.200(Ft.)
Pipe length =   990.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow =    81.807(CFS)
Given pipe size =     39.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
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```
The approximate hydraulic grade line above the pipe invert is
     8.180(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      9.715(Ft.)
 Minor friction loss =     2.265(Ft.)    K-factor =   1.50
Pipe flow velocity =      9.86(Ft/s)
Travel time through pipe =    1.67 min.
Time of concentration (TC) =    17.51 min.


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Process from Point/Station       31.000 to Point/Station       31.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     42.244(Ac.)
Runoff from this stream =     81.807(CFS)
Time of concentration =   17.51 min.
Rainfall intensity =     2.297(In/Hr)
Area averaged loss rate (Fm) =    0.3455(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3696


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Process from Point/Station      708.000 to Point/Station      709.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1072.000(Ft.)
Bottom (of initial area) elevation =  1069.200(Ft.)
Difference in elevation =     2.800(Ft.)
Slope =    0.00280  s(%)=       0.28
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   19.976 min.
Rainfall intensity =      2.122(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.744
Subarea runoff =     11.850(CFS)
Total initial stream area =        7.500(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.367(In/Hr)


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Process from Point/Station      709.000 to Point/Station      710.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1069.200(Ft.)
End of street segment elevation =  1062.600(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(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 [1] side(s) of the street
Distance from curb to property line  =  13.000(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 =     27.649(CFS)
Depth of flow =   0.617(Ft.), Average velocity =   4.012(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  26.116(Ft.)
Flow velocity =   4.01(Ft/s)
Travel time =    2.74 min.     TC =   22.72  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Rainfall intensity =      1.965(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.732
Subarea runoff =     27.697(CFS) for   20.000(Ac.)
Total runoff =     39.547(CFS)
Effective area this stream =       27.50(Ac.)
Total Study Area (Main Stream No. 1) =       85.00(Ac.)
Area averaged Fm value =    0.367(In/Hr)
Street flow at end of street =     39.547(CFS)
Half street flow at end of street =     39.547(CFS)
Depth of flow =   0.700(Ft.), Average velocity =   4.278(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    1.66(Ft.)
Flow width (from curb towards crown)=  30.242(Ft.)


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Process from Point/Station      710.000 to Point/Station      710.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     27.500(Ac.)
Runoff from this stream =     39.547(CFS)
Time of concentration =   22.72 min.
Rainfall intensity =     1.965(In/Hr)
Area averaged loss rate (Fm) =    0.3670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

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


1       81.807     17.51                2.297
2       39.547     22.72                1.965
Qmax(1) =
         1.000 *    1.000 *    81.807) +
         1.208 *    0.771 *    39.547) + =     118.627
Qmax(2) =
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          0.830 *    1.000 *    81.807) +
          1.000 *    1.000 *    39.547) + =     107.433

Total of 2 streams to confluence:
Flow rates before confluence point:
      81.807      39.547
Maximum flow rates at confluence using above data:
     118.627     107.433
Area of streams before confluence:
      42.244      27.500
Effective area values after confluence:
      63.443      69.744
Results of confluence:
Total flow rate =    118.627(CFS)
Time of concentration =    17.512 min.
Effective stream area after confluence =     63.443(Ac.)
Stream Area average Pervious fraction(Ap) =  0.421
Stream Area average soil loss rate(Fm) =    0.354(In/Hr)
Study area (this main stream) =      69.74(Ac.)


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Process from Point/Station       31.000 to Point/Station       32.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1056.600(Ft.)
Downstream point/station elevation =  1052.000(Ft.)
Pipe length  =   660.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   118.627(CFS)
Given pipe size =     39.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    13.782(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     13.619(Ft.)
 Minor friction loss =      4.763(Ft.)    K-factor =   1.50
Pipe flow velocity =     14.30(Ft/s)
Travel time through pipe =    0.77 min.
Time of concentration (TC) =    18.28 min.


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Process from Point/Station       32.000 to Point/Station       32.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     63.443(Ac.)
Runoff from this stream =    118.627(CFS)
Time of concentration =   18.28 min.
Rainfall intensity =     2.238(In/Hr)
Area averaged loss rate (Fm) =    0.3539(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4210


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Process from Point/Station      711.000 to Point/Station      712.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
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Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1069.600(Ft.)
Bottom (of initial area) elevation =  1062.100(Ft.)
Difference in elevation =     7.500(Ft.)
Slope =    0.00750  s(%)=       0.75
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   16.404 min.
Rainfall intensity =      2.389(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.762
Subarea runoff =      9.098(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.367(In/Hr)


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Process from Point/Station      712.000 to Point/Station      713.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1062.100(Ft.)
End of street segment elevation =  1058.000(Ft.)
Length of street segment  =   990.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(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 [1] side(s) of the street
Distance from curb to property line  =  13.000(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 =     22.746(CFS)
Depth of flow =   0.669(Ft.), Average velocity =   2.740(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    0.11(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  28.690(Ft.)
Flow velocity =   2.74(Ft/s)
Travel time =    6.02 min.     TC =   22.43  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.367(In/Hr)
Rainfall intensity =      1.980(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.733
Subarea runoff =     19.939(CFS) for   15.000(Ac.)
Total runoff =     29.037(CFS)
Effective area this stream =       20.00(Ac.)
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Total Study Area (Main Stream No. 1) =      105.00(Ac.)
Area averaged Fm value =    0.367(In/Hr)
Street flow at end of street =     29.037(CFS)
Half street flow at end of street =     29.037(CFS)
Depth of flow =   0.735(Ft.), Average velocity =   2.786(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    3.41(Ft.)
Flow width (from curb towards crown)=  31.992(Ft.)

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Process from Point/Station      713.000 to Point/Station      713.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     20.000(Ac.)
Runoff from this stream =     29.037(CFS)
Time of concentration =   22.43 min.
Rainfall intensity =     1.980(In/Hr)
Area averaged loss rate (Fm) =    0.3670(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

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


1       118.627      18.28                2.238
2        29.037      22.43                1.980
Qmax(1) =
          1.000 *     1.000 *   118.627) +
          1.160 *     0.815 *    29.037) + =     146.088
Qmax(2) =
          0.863 *     1.000 *   118.627) +
          1.000 *     1.000 *    29.037) + =     131.405

Total of 2 streams to confluence:
Flow rates before confluence point:
     118.627      29.037
Maximum flow rates at confluence using above data:
      146.088      131.405
Area of streams before confluence:
       63.443       20.000
Effective area values after confluence:
       79.746       83.443
Results of confluence:
Total flow rate =    146.088(CFS)
Time of concentration =    18.281 min.
Effective stream area after confluence =     79.746(Ac.)
Stream Area average Pervious fraction(Ap) =  0.440
Stream Area average soil loss rate(Fm) =    0.357(In/Hr)
Study area (this main stream) =      83.44(Ac.)

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Process from Point/Station       32.000 to Point/Station       35.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1052.000(Ft.)
Downstream point/station elevation =  1041.000(Ft.)
Pipe length  =  1320.00(Ft.)   Manning's N = 0.013
```

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No. of pipes = 1  Required pipe flow  =   146.088(CFS)
Given pipe size =     51.00(In.)
Calculated individual pipe flow  =   146.088(CFS)
Normal flow depth in pipe =   39.56(In.)
Flow top width inside pipe =   42.54(In.)
Critical Depth =   42.87(In.)
Pipe flow velocity =     12.36(Ft/s)
Travel time through pipe =    1.78 min.
Time of concentration (TC) =    20.06 min.


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Process from Point/Station       35.000 to Point/Station       35.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     79.746(Ac.)
Runoff from this stream =    146.088(CFS)
Time of concentration =   20.06 min.
Rainfall intensity =     2.117(In/Hr)
Area averaged loss rate (Fm) =    0.3571(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4399


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Process from Point/Station       35.000 to Point/Station       35.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 36.98
Pervious ratio(Ap) = 0.2280     Max loss rate(Fm)=     0.215(In/Hr)
Rainfall intensity =      2.005(In/Hr) for a    25.0 year storm
User specified values are as follows:
TC =  21.97 min.  Rain intensity =       2.00(In/Hr)
Total area this stream =       116.10(Ac.)
Total Study Area (Main Stream No. 1) =      221.10(Ac.)
Total runoff =    198.18(CFS)


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Process from Point/Station       35.000 to Point/Station       35.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =    116.100(Ac.)
Runoff from this stream =    198.180(CFS)
Time of concentration =   21.97 min.
Rainfall intensity =     2.005(In/Hr)
Area averaged loss rate (Fm) =    0.2150(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2280
Summary of stream data:

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


1      146.088     20.06                2.117
2      198.180     21.97                2.005
Qmax(1) =
        1.000 *    1.000 *   146.088) +
```

```
          1.063 *    0.913 *   198.180) + =     338.411
Qmax(2) =
          0.936 *    1.000 *   146.088) +
          1.000 *    1.000 *   198.180) + =     334.941

Total of 2 streams to confluence:
Flow rates before confluence point:
     146.088     198.180
Maximum flow rates at confluence using above data:
      338.411      334.941
Area of streams before confluence:
       79.746      116.100
Effective area values after confluence:
      185.759      195.846
Results of confluence:
Total flow rate =    338.411(CFS)
Time of concentration =    20.061 min.
Effective stream area after confluence =    185.759(Ac.)
Stream Area average Pervious fraction(Ap) =  0.314
Stream Area average soil loss rate(Fm) =    0.273(In/Hr)
Study area (this main stream) =     195.85(Ac.)


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Process from Point/Station       35.000 to Point/Station       38.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1041.000(Ft.)
Downstream point/station elevation =  1035.000(Ft.)
Pipe length  =  1320.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   338.411(CFS)
Given pipe size =     84.00(In.)
Calculated individual pipe flow  =   338.411(CFS)
Normal flow depth in pipe =   56.06(In.)
Flow top width inside pipe =   79.15(In.)
Critical Depth =   58.21(In.)
Pipe flow velocity =     12.39(Ft/s)
Travel time through pipe =    1.78 min.
Time of concentration (TC) =    21.84 min.


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Process from Point/Station       38.000 to Point/Station       38.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    185.759(Ac.)
Runoff from this stream =    338.411(CFS)
Time of concentration =   21.84 min.
Rainfall intensity =     2.012(In/Hr)
Area averaged loss rate (Fm) =    0.2728(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3143


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Process from Point/Station       38.000 to Point/Station       38.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 31.98
```

```
Pervious ratio(Ap) = 0.3170     Max loss rate(Fm)=     0.310(In/Hr)
Rainfall intensity =      2.042(In/Hr) for a    25.0 year storm
User specified values are as follows:
TC =  21.31 min.  Rain intensity =       2.04(In/Hr)
Total area this stream =       109.32(Ac.)
Total Study Area (Main Stream No. 1) =      330.42(Ac.)
Total runoff =    182.37(CFS)


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Process from Point/Station       38.000 to Point/Station       38.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =    109.320(Ac.)
Runoff from this stream =    182.370(CFS)
Time of concentration =   21.31 min.
Rainfall intensity =     2.042(In/Hr)
Area averaged loss rate (Fm) =    0.3100(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3170
Summary of stream data:

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


1       338.411      21.84                2.012
2       182.370      21.31                2.042
Qmax(1) =
          1.000 *     1.000 *   338.411) +
          0.983 *     1.000 *   182.370) + =     517.654
Qmax(2) =
          1.017 *     0.976 *   338.411) +
          1.000 *     1.000 *   182.370) + =     518.256

Total of 2 streams to confluence:
Flow rates before confluence point:
     338.411     182.370
Maximum flow rates at confluence using above data:
      517.654      518.256
Area of streams before confluence:
      185.759      109.320
Effective area values after confluence:
      295.079      290.599
Results of confluence:
Total flow rate =    518.256(CFS)
Time of concentration =    21.310 min.
Effective stream area after confluence =    290.599(Ac.)
Stream Area average Pervious fraction(Ap) =  0.315
Stream Area average soil loss rate(Fm) =    0.287(In/Hr)
Study area (this main stream) =     295.08(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       38.000 to Point/Station       39.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1035.000(Ft.)
Downstream point/station elevation =  1026.600(Ft.)
Pipe length  =   990.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   518.256(CFS)
```

```
Given pipe size =     84.00(In.)
Calculated individual pipe flow  =   518.256(CFS)
Normal flow depth in pipe =   61.22(In.)
Flow top width inside pipe =   74.69(In.)
Critical Depth =   71.20(In.)
Pipe flow velocity =     17.26(Ft/s)
Travel time through pipe =    0.96 min.
Time of concentration (TC) =    22.27 min.


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Process from Point/Station       39.000 to Point/Station       39.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    290.599(Ac.)
Runoff from this stream =    518.256(CFS)
Time of concentration =   22.27 min.
Rainfall intensity =     1.989(In/Hr)
Area averaged loss rate (Fm) =    0.2866(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3153


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Process from Point/Station      817.000 to Point/Station      818.000
**** 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 =  1000.000(Ft.)
Top (of initial area) elevation =  1049.000(Ft.)
Bottom (of initial area) elevation =  1044.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =     2.275(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.707
Subarea runoff =      8.039(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.489(In/Hr)


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Process from Point/Station      818.000 to Point/Station      819.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1044.000(Ft.)
End of street segment elevation =  1042.300(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     12.059(CFS)
Depth of flow =   0.426(Ft.), Average velocity =   2.144(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  16.557(Ft.)
Flow velocity =   2.14(Ft/s)
Travel time =    2.57 min.     TC =   20.35  min.
 Adding area flow to street
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)
Rainfall intensity =      2.099(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.690
Subarea runoff =      6.449(CFS) for    5.000(Ac.)
Total runoff =     14.488(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =      340.42(Ac.)
Area averaged Fm value =    0.489(In/Hr)
Street flow at end of street =     14.488(CFS)
Half street flow at end of street =      7.244(CFS)
Depth of flow =   0.450(Ft.), Average velocity =   2.243(Ft/s)
Flow width (from curb towards crown)=  17.772(Ft.)


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Process from Point/Station      819.000 to Point/Station      820.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1042.300(Ft.)
End of street segment elevation =  1039.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     21.732(CFS)
Depth of flow =   0.509(Ft.), Average velocity =   2.494(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
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Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.49(Ft/s)
Travel time =    4.41 min.     TC =   24.77  min.
 Adding area flow to street
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)
Rainfall intensity =      1.866(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.664
Subarea runoff =     10.294(CFS) for   10.000(Ac.)
Total runoff =     24.782(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 1) =      350.42(Ac.)
Area averaged Fm value =    0.489(In/Hr)
Street flow at end of street =     24.782(CFS)
Half street flow at end of street =     12.391(CFS)
Depth of flow =   0.527(Ft.), Average velocity =   2.627(Ft/s)
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      820.000 to Point/Station      821.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1039.000(Ft.)
End of street segment elevation =  1037.000(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(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 [1] side(s) of the street
Distance from curb to property line  =  13.000(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 =     30.977(CFS)
Depth of flow =   0.701(Ft.), Average velocity =   3.332(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    1.74(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  30.325(Ft.)
Flow velocity =   3.33(Ft/s)
Travel time =    1.65 min.     TC =   26.42  min.
 Adding area flow to street
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
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```
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.489(In/Hr)
Rainfall intensity =      1.795(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.655
Subarea runoff =     10.478(CFS) for   10.000(Ac.)
Total runoff =     35.260(CFS)
Effective area this stream =       30.00(Ac.)
Total Study Area (Main Stream No. 1) =      360.42(Ac.)
Area averaged Fm value =    0.489(In/Hr)
Street flow at end of street =     35.260(CFS)
Half street flow at end of street =     35.260(CFS)
Depth of flow =   0.736(Ft.), Average velocity =   3.372(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    3.46(Ft.)
Flow width (from curb towards crown)=  32.042(Ft.)


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Process from Point/Station      821.000 to Point/Station      821.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     30.000(Ac.)
Runoff from this stream =     35.260(CFS)
Time of concentration =   26.42 min.
Rainfall intensity =     1.795(In/Hr)
Area averaged loss rate (Fm) =    0.4889(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

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


1       518.256      22.27                1.989
2        35.260      26.42                1.795
Qmax(1) =
          1.000 *     1.000 *   518.256) +
          1.148 *     0.843 *    35.260) + =     552.387
Qmax(2) =
          0.886 *     1.000 *   518.256) +
          1.000 *     1.000 *    35.260) + =     494.489

Total of 2 streams to confluence:
Flow rates before confluence point:
     518.256      35.260
Maximum flow rates at confluence using above data:
      552.387      494.489
Area of streams before confluence:
      290.599       30.000
Effective area values after confluence:
      315.885      320.599
Results of confluence:
Total flow rate =    552.387(CFS)
Time of concentration =    22.266 min.
Effective stream area after confluence =    315.885(Ac.)
Stream Area average Pervious fraction(Ap) =  0.333
Stream Area average soil loss rate(Fm) =    0.306(In/Hr)
Study area (this main stream) =     320.60(Ac.)
```

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Process from Point/Station       39.000 to Point/Station       40.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1026.600(Ft.)
Downstream point/station elevation =  1012.800(Ft.)
Pipe length  =  1720.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   552.387(CFS)
Given pipe size =     84.00(In.)
Calculated individual pipe flow  =   552.387(CFS)
Normal flow depth in pipe =   66.38(In.)
Flow top width inside pipe =   68.41(In.)
Critical Depth =   73.04(In.)
Pipe flow velocity =     16.94(Ft/s)
Travel time through pipe =    1.69 min.
Time of concentration (TC) =    23.96 min.


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Process from Point/Station       40.000 to Point/Station       40.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    315.885(Ac.)
Runoff from this stream =    552.387(CFS)
Time of concentration =   23.96 min.
Rainfall intensity =     1.903(In/Hr)
Area averaged loss rate (Fm) =    0.3055(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3326


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Process from Point/Station      822.000 to Point/Station      823.000
**** 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 =  1000.000(Ft.)
Top (of initial area) elevation =  1037.700(Ft.)
Bottom (of initial area) elevation =  1034.300(Ft.)
Difference in elevation =     3.400(Ft.)
Slope =    0.00340  s(%)=       0.34
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   19.216 min.
Rainfall intensity =      2.172(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.697
Subarea runoff =      7.576(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.489(In/Hr)


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Process from Point/Station      823.000 to Point/Station      824.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
```

```
Top of street segment elevation =  1034.300(Ft.)
End of street segment elevation =  1032.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(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 =     11.364(CFS)
Depth of flow =   0.444(Ft.), Average velocity =   1.823(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  17.451(Ft.)
Flow velocity =   1.82(Ft/s)
Travel time =    6.03 min.     TC =   25.25  min.
 Adding area flow to street
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)
Rainfall intensity =      1.844(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.661
Subarea runoff =      4.621(CFS) for    5.000(Ac.)
Total runoff =     12.198(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =      370.42(Ac.)
Area averaged Fm value =    0.489(In/Hr)
Street flow at end of street =     12.198(CFS)
Half street flow at end of street =      6.099(CFS)
Depth of flow =   0.454(Ft.), Average velocity =   1.855(Ft/s)
Flow width (from curb towards crown)=  17.933(Ft.)


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Process from Point/Station      824.000 to Point/Station      825.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
```

```
Top of street segment elevation =  1032.000(Ft.)
End of street segment elevation =  1027.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(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 [1] side(s) of the street
Distance from curb to property line  =  13.000(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 =     18.296(CFS)
Depth of flow =   0.566(Ft.), Average velocity =   3.262(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  23.533(Ft.)
Flow velocity =   3.26(Ft/s)
Travel time =    3.37 min.     TC =   28.62  min.
 Adding area flow to street
CONDOMINIUM 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) = 0.3500     Max loss rate(Fm)=     0.342(In/Hr)
Rainfall intensity =      1.711(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.681
Subarea runoff =     11.112(CFS) for   10.000(Ac.)
Total runoff =     23.310(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 1) =      380.42(Ac.)
Area averaged Fm value =    0.416(In/Hr)
Street flow at end of street =     23.310(CFS)
Half street flow at end of street =     23.310(CFS)
Depth of flow =   0.611(Ft.), Average velocity =   3.464(Ft/s)
Flow width (from curb towards crown)=  25.802(Ft.)


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Process from Point/Station      825.000 to Point/Station      826.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1027.000(Ft.)
End of street segment elevation =  1023.000(Ft.)
Length of street segment  =   750.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(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 [1] side(s) of the street
Distance from curb to property line  =  13.000(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 =     26.806(CFS)
Depth of flow =   0.679(Ft.), Average velocity =   3.112(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    0.64(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  29.221(Ft.)
Flow velocity =   3.11(Ft/s)
Travel time =    4.02 min.     TC =   32.64  min.
 Adding area flow to street
```

```
CONDOMINIUM 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) = 0.3500     Max loss rate(Fm)=     0.342(In/Hr)
Rainfall intensity =      1.581(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.673
Subarea runoff =      4.356(CFS) for    6.000(Ac.)
Total runoff =     27.666(CFS)
Effective area this stream =       26.00(Ac.)
Total Study Area (Main Stream No. 1) =      386.42(Ac.)
Area averaged Fm value =    0.399(In/Hr)
Street flow at end of street =     27.666(CFS)
Half street flow at end of street =     27.666(CFS)
Depth of flow =   0.688(Ft.), Average velocity =   3.116(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    1.07(Ft.)
Flow width (from curb towards crown)=  29.657(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      826.000 to Point/Station      826.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     26.000(Ac.)
Runoff from this stream =     27.666(CFS)
Time of concentration =   32.64 min.
Rainfall intensity =     1.581(In/Hr)
Area averaged loss rate (Fm) =    0.3986(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4077
Summary of stream data:

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


1      552.387     23.96                1.903
2       27.666     32.64                1.581
Qmax(1) =
         1.000 *    1.000 *   552.387) +
         1.273 *    0.734 *    27.666) + =     578.231
Qmax(2) =
         0.798 *    1.000 *   552.387) +
         1.000 *    1.000 *    27.666) + =     468.647

Total of 2 streams to confluence:
Flow rates before confluence point:
     552.387      27.666
Maximum flow rates at confluence using above data:
      578.231      468.647
Area of streams before confluence:
      315.885       26.000
Effective area values after confluence:
      334.971      341.885
Results of confluence:
Total flow rate =    578.231(CFS)
Time of concentration =    23.959 min.
```

```
Effective stream area after confluence =    334.971(Ac.)
Stream Area average Pervious fraction(Ap) =  0.338
Stream Area average soil loss rate(Fm) =    0.313(In/Hr)
Study area (this main stream) =     341.88(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       40.000 to Point/Station       94.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1011.300(Ft.)
Downstream point/station elevation =  1004.000(Ft.)
Pipe length  =   900.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   578.231(CFS)
Given pipe size =    102.00(In.)
Calculated individual pipe flow  =   578.231(CFS)
Normal flow depth in pipe =   56.91(In.)
Flow top width inside pipe =  101.31(In.)
Critical Depth =   72.44(In.)
Pipe flow velocity =     17.78(Ft/s)
Travel time through pipe =    0.84 min.
Time of concentration (TC) =    24.80 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       94.000 to Point/Station       94.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    334.971(Ac.)
Runoff from this stream =    578.231(CFS)
Time of concentration =   24.80 min.
Rainfall intensity =     1.864(In/Hr)
Area averaged loss rate (Fm) =    0.3126(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3383


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      827.000 to Point/Station      828.000
**** 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 =   900.000(Ft.)
Top (of initial area) elevation =  1023.000(Ft.)
Bottom (of initial area) elevation =  1014.000(Ft.)
Difference in elevation =     9.000(Ft.)
Slope =    0.01000  s(%)=       1.00
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.847 min.
Rainfall intensity =      2.536(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.726
Subarea runoff =     11.055(CFS)
Total initial stream area =        6.000(Ac.)
Pervious area fraction = 0.500
```

```
Initial area Fm value =     0.489(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      828.000 to Point/Station      828.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =       6.000(Ac.)
Runoff from this stream =      11.055(CFS)
Time of concentration =   14.85 min.
Rainfall intensity =      2.536(In/Hr)
Area averaged loss rate (Fm) =     0.4889(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

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


1       578.231      24.80                1.864
2        11.055      14.85                2.536
Qmax(1) =
          1.000 *     1.000 *    578.231) +
          0.672 *     1.000 *     11.055) + =      585.656
Qmax(2) =
          1.433 *     0.599 *    578.231) +
          1.000 *     1.000 *     11.055) + =      507.139

Total of 2 streams to confluence:
Flow rates before confluence point:
     578.231      11.055
Maximum flow rates at confluence using above data:
      585.656      507.139
Area of streams before confluence:
      334.971        6.000
Effective area values after confluence:
      340.971      206.522
Results of confluence:
Total flow rate =     585.656(CFS)
Time of concentration =     24.802 min.
Effective stream area after confluence =     340.971(Ac.)
Stream Area average Pervious fraction(Ap) =  0.341
Stream Area average soil loss rate(Fm) =     0.316(In/Hr)
Study area (this main stream) =      340.97(Ac.)
End of computations, Total Study Area =          392.42 (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) = 0.343
Area averaged SCS curve number =  36.8
```

DECLEZ CHL.

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
Rational Hydrology Study Date: 01/13/05

FONTANA / DECLEZ CHANNEL HYDROLOGY
25 YEAR STORM
JN 04339

Hall & Forman, Inc. - S/N 950

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

Rational hydrology study storm event year is 25.0
10 Year storm 1 hour rainfall = 0.930(In.)
100 Year storm 1 hour rainfall = 1.350(In.)
Computed rainfall intensity:
Storm year = 25.00 1 hour rainfall = 1.097 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

++
Process from Point/Station 93.000 to Point/Station 93.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 67.05
Pervious ratio(Ap) = 0.5160 Max loss rate(Fm)= 0.298(In/Hr)
Rainfall intensity = 2.394(In/Hr) for a 25.0 year storm
User specified values are as follows:
TC = 16.34 min. Rain intensity = 2.39(In/Hr)
Total area this stream = 816.23(Ac.)
Total Study Area (Main Stream No. 1) = 816.23(Ac.)
Total runoff = 2004.30(CFS)

++
Process from Point/Station 93.000 to Point/Station 94.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 1005.500(Ft.)
Downstream point elevation = 1004.000(Ft.)
Channel length thru subarea = 500.000(Ft.)
Channel base width = 24.000(Ft.)
Slope or 'Z' of left channel bank = 0.000
Slope or 'Z' of right channel bank = 0.000
Manning's 'N' = 0.015
Maximum depth of channel = 9.000(Ft.)
Flow(q) thru subarea = 2004.300(CFS)
Depth of flow = 6.075(Ft.), Average velocity = 13.748(Ft/s)
Channel flow top width = 24.000(Ft.)
Flow Velocity = 13.75(Ft/s)
Travel time = 0.61 min.
Time of concentration = 16.95 min.

```
Critical depth =      6.000(Ft.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       94.000 to Point/Station       94.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    816.230(Ac.)
Runoff from this stream =   2004.300(CFS)
Time of concentration =   16.95 min.
Rainfall intensity =     2.343(In/Hr)
Area averaged loss rate (Fm) =    0.2980(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5160

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       94.000 to Point/Station       94.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 38.89
Pervious ratio(Ap) = 0.3410     Max loss rate(Fm)=     0.316(In/Hr)
Rainfall intensity =      1.864(In/Hr) for a    25.0 year storm
User specified values are as follows:
TC =  24.80 min.  Rain intensity =       1.86(In/Hr)
Total area this stream =       340.97(Ac.)
Total Study Area (Main Stream No. 1) =     1157.20(Ac.)
Total runoff =    585.66(CFS)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       94.000 to Point/Station       94.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =    340.970(Ac.)
Runoff from this stream =    585.660(CFS)
Time of concentration =   24.80 min.
Rainfall intensity =     1.864(In/Hr)
Area averaged loss rate (Fm) =    0.3160(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3410
Summary of stream data:

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


1     2004.300      16.95                2.343
2      585.660      24.80                1.864
Qmax(1) =
         1.000 *    1.000 *  2004.300) +
         1.309 *    0.683 *   585.660) + =    2528.181
Qmax(2) =
         0.766 *    1.000 *  2004.300) +
         1.000 *    1.000 *   585.660) + =    2120.895

Total of 2 streams to confluence:
Flow rates before confluence point:
    2004.300     585.660
```

```
Maximum flow rates at confluence using above data:
     2528.181     2120.895
Area of streams before confluence:
      816.230      340.970
Effective area values after confluence:
     1049.219     1157.200
Results of confluence:
Total flow rate =   2528.181(CFS)
Time of concentration =    16.946 min.
Effective stream area after confluence =   1049.219(Ac.)
Stream Area average Pervious fraction(Ap) =  0.464
Stream Area average soil loss rate(Fm) =    0.303(In/Hr)
Study area (this main stream) =    1157.20(Ac.)
End of computations, Total Study Area =         1157.20 (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) = 0.464
Area averaged SCS curve number =  58.8
```

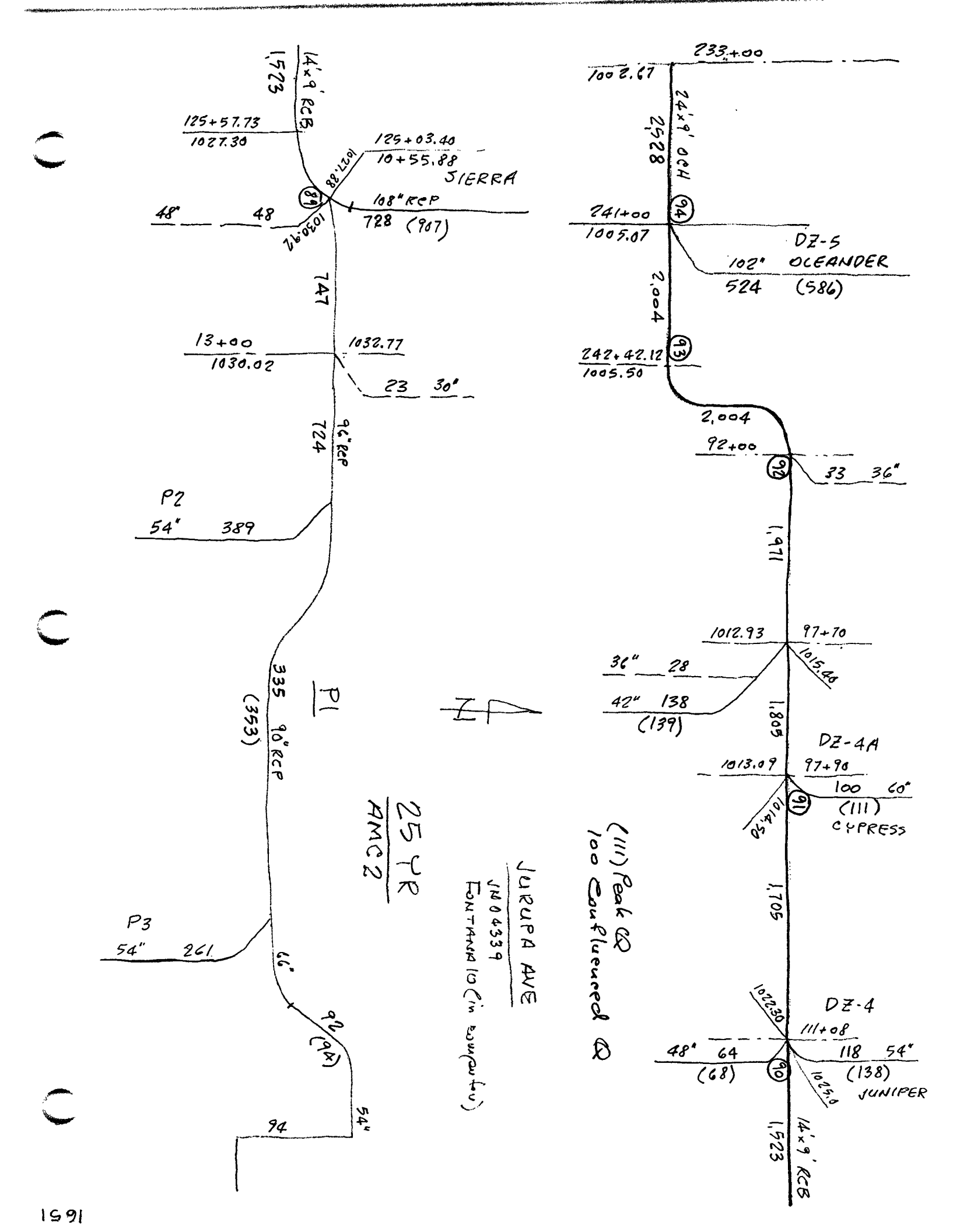
HYDRAULICS

HALL & FOREMAN, INC.
Exchange, Suite 100
[illegible], CA 92602-1301
[illegible]4500
[illegible]565-2301

◆ LAND PLANNING ◆ CIVIL ENGINEERING ◆ SURVEYING

JOB No. _____
BY _____
DATE _____
SHT. 1650
OF _____

25 YEAR


1,723
14'x9' RCB
125+57.73
1027.30
125+03.40
10+55.88
1027.88
SIERRA
89
108" RCP
728 (907)
48"
48
1030.92
747
13+00
1030.02
1032.77
23 30"
724
96" RCP
P2
54" 389
P1
335 (353)
90" RCP
P3
54" 261
66"
92 (94)
54"
94
25 YR
AMC2
JURUPA AVE
JN 04339
FONTANA TO Cin Boundary
233+00
1002.67
24'x9' OCH
2,528
94
241+00
1005.07
DZ-5
102" OLEANDER
524 (586)
2,004
93
242+42.12
1005.50
2,004
92+00
92
33 36"
1,971
1012.93
97+70
1015.48
36" 28
42" 138
(139)
1,805
DZ-4A
1013.09
97+90
100 60"
91
(111)
CYPRESS
1015.45
1,705
(111) Peak Q
100 Conf luenced Q
1022.30
DZ-4
111+08
48" 64
(68)
118 54"
(138)
90
JUNIPER
1025.0
1,523
14'x9' RCB

```
T1     FONTANA / DECLEZ CHANNEL W/O DETENTION (AMC2)                    0
0
T2          25  YEAR STORM
T3                JN 04339
SO  23300.0001002.670  1                          1002.670
R   24100.0001005.070  1       .014                                .000
.000 0
JX  24100.0101005.070  1  2    .014  524.000          1005.070        .0
.000
R   24242.1201005.500  1       .014                                .000
WX  24242.1201005.500  3
R   24242.1301005.500  3       .013                                .000
.000 0
SH  24242.1301005.500  3                          1005.500
CD   1  2   0    .000  11.000   24.000  .000  .000   .00
CD   2  4   1    .000   9.000     .000  .000  .000   .00
CD   3  3   0    .000   9.000   14.000  .000  .000   .00
Q           2004.000   .0
```

FILE: DECLEZOCH.WSW W S P G W - EDIT LISTING - Version 14.05 Date: 1-16-2005 Time: 3:33:50

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	2	0	.000	11.000	24.000			.00										
CD	2	4	1		9.000														
CD	3	3	0	.000	9.000	14.000	.000	.000	.00										

W S P G W PAGE NO 1

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

FONTANA / DECLEZ CHANNEL W/O DETENTION (AMC2) 0

HEADING LINE NO 2 IS -

25 YEAR STORM

HEADING LINE NO 3 IS -

JN 04339

W S P G W PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	23300.000	1002.670	1	1002.670

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	24100.000	1005.070	1	.014	.000	.000	.000	0

ELEMENT NO 3 IS A JUNCTION * * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	24100.010	1005.070	1	2	0	.014	524.000	.000	1005.070	.000	.000	.000

RADIUS	ANGLE
.000	.000

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 4 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	24242.120	1005.500	1	.014	.000	.000	.000	0

ELEMENT NO 5 IS A WALL EXIT *

U/S DATA	STATION	INVERT	SECT
	24242.120	1005.500	3

ELEMENT NO 6 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	24242.130	1005.500	3	.013	.000	.000	.000	0

ELEMENT NO 7 IS A SYSTEM HEADWORKS * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	24242.130	1005.500	3	1005.500

Program Package Serial Number: 1432

WATER SURFACE PROFILE LISTING Date: 1-16-2005 Time: 3:33:34

FONTANA / DECLEZ CHANNEL W/O DETENTION (AMC2) 0

25 YEAR STORM

JN 04339

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
23300.000	1002.670	6.806	1009.476	2528.00	15.48	3.72	1013.20	.00	7.01	24.00	11.000	24.000	.00	0 .0
722.635	.0030					.0030	2.17	6.81	1.05	6.81	.014	.00	.00	RECTANG
24022.630	1004.838	6.806	1011.644	2528.00	15.48	3.72	1015.36	.00	7.01	24.00	11.000	24.000	.00	0 .0
77.365	.0030					.0029	.22	6.81	1.05	6.81	.014	.00	.00	RECTANG
24100.000	1005.070	7.010	1012.080	2528.00	15.03	3.51	1015.59	.00	7.01	24.00	11.000	24.000	.00	0 .0
JUNCT STR	.0000					.0018	.00	7.01	1.00		.014	.00	.00	RECTANG
24100.010	1005.070	9.499	1014.569	2004.00	8.79	1.20	1015.77	.00	6.01	24.00	11.000	24.000	.00	0 .0
142.109	.0030					.0008	.11	9.50	.50	5.77	.014	.00	.00	RECTANG
24242.120	1005.500	9.064	1014.564	2004.00	9.21	1.32	1015.88	.00	6.01	24.00	11.000	24.000	.00	0 .0
WALL	EXIT													
24242.120	1005.500	9.064	1014.564	2004.00	15.90	3.93	1018.49	.00	8.60	14.00	9.000	14.000	.00	0 .0
.012	.0000					.0051	.00	9.06	.93	.00	.013	.00	.00	BOX
24242.130	1005.500	9.064	1014.564	2004.00	15.90	3.93	1018.49	.00	8.60	14.00	9.000	14.000	.00	0 .0

```
T1      FONTANA / JURUPA AVE. 14'x 9' RCB W/O DETENTION (AMC2)
0
T2       25 YEAR STORM
T3        JN 04339
SO   7990.5001005.500  1                          1016.140
R    8003.0701005.530  1      .013                                .000
.000 0
R    8143.7401005.810  1      .013                              -89.554
.000 0
R    8600.0001006.720  1      .013                                .000
.000 0
R    9200.0001009.720  1      .013                                .000
.000 0
JX   9200.0101009.720  1  2   .013   33.000         1013.220       -45.0
.000
R    9680.0001012.120  1      .013                                .000
.000 0
R    9770.0001012.930  1      .013                                .000
.000 0
JX   9770.0101012.930  1  2   .013   28.000         1015.400        45.0
.000
R    9770.0201012.930  1      .013                                .000
.000 0
JX   9770.0301012.930  1  3   .013  138.000         1015.400        45.0
.000
R    9790.0001013.090  1      .013                                .000
.000 0
JX   9790.0101013.090  1  4   .013  100.000         1014.500       -45.0
.000
R   10700.0001019.670  1      .013                                .000
.000 0
R   11000.0001021.870  1      .013                                .000
.000 0
R   11108.0001022.300  1      .013                                .000
.000 0
JX  11108.0101022.300  1  5  6.013   64.000  118.0001025.0001025.000 45.0-45.0
.000
R   12357.7301027.300  1      .013                                .000
.000 0
R   12503.4001027.860  1      .013                              -39.369
.000 0
JX  12503.4101028.860  8  7  1.013   48.000  728.0001029.9201027.860 45.0   .0
.000
R   12528.3001028.900  8      .013                               30.000
.000 0
SH  12528.3001028.900  8                          1028.900
CD   1  3   0    .000   9.000   14.000  .000  .000   .00
CD   2  4   1    .000   3.000     .000  .000  .000   .00
CD   3  4   1    .000   3.500     .000  .000  .000   .00
CD   4  4   1    .000   5.000     .000  .000  .000   .00
CD   5  4   1    .000   4.000     .000  .000  .000   .00
CD   6  4   1    .000   4.500     .000  .000  .000   .00
CD   7  4   1    .000   4.000     .000  .000  .000   .00
CD   8  4   1    .000   8.000     .000  .000  .000   .00
Q           747.000   .0
```

FILE: JURUPARCB.WSW W S P G W - EDIT LISTING - Version 14.05 Date: 1-16-2005 Time: 4: 2:51

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	3	0	.000	9.000	14.000	.000	.000	.00										
CD	2	4	1		3.000														
CD	3	4	1		3.500														
CD	4	4	1		5.000														
CD	5	4	1		4.000														
CD	6	4	1		4.500														
CD	7	4	1		4.000														
CD	8	4	1		8.000														

W S P G W PAGE NO 1

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

FONTANA / JURUPA AVE. 14'x 9' RCB W/O DETENTION (AMC2)

HEADING LINE NO 2 IS -

100 YEAR STORM

HEADING LINE NO 3 IS -

JN 04339

W S P G W PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	7990.500	1005.500	1	1016.140

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	8003.070	1005.530	1	.013	.000	.000	.000	0

ELEMENT NO 3 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	8143.740	1005.810	1	.013	90.000	-89.554	.000	0

ELEMENT NO 4 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	8600.000	1006.720	1	.013	.000	.000	.000	0

ELEMENT NO 5 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	9200.000	1009.720	1	.013	.000	.000	.000	0

ELEMENT NO 6 IS A JUNCTION * * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	9200.010	1009.720	1	2	0	.013	33.000	.000	1013.220	.000	-45.000	.000

RADIUS	ANGLE
.000	.000

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 7 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	9680.000	1012.120	1	.013	.000	.000	.000	0

ELEMENT NO 8 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	9770.000	1012.930	1	.013	.000	.000	.000	0

ELEMENT NO 9 IS A JUNCTION * * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	9770.010	1012.930	1	2	0	.013	28.000	.000	1015.400	.000	45.000	.000

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                                                                                                    RADIUS    ANGLE
                                                                                                     .000     .000
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
                                          W S P G W                                                                  PAGE NO   3
                          WATER SURFACE PROFILE - ELEMENT CARD LISTING
 ELEMENT NO  10 IS A REACH                *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               9770.020 1012.930    1              .013                           .000     .000      .000      0
 ELEMENT NO  11 IS A JUNCTION             *         *     *     *                 *                *                 *
                    U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3        Q4     INVERT-3 INVERT-4  PHI 3  PHI 4
                               9770.030 1012.930    1     3     0   .013   138.000      .000  1015.400      .000  45.000      .000
                                                                                                    RADIUS    ANGLE
                                                                                                     .000     .000
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
 ELEMENT NO  12 IS A REACH                *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                               9790.000 1013.090    1              .013                           .000     .000      .000      0
 ELEMENT NO  13 IS A JUNCTION             *         *     *     *                 *                *                 *
                    U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3        Q4     INVERT-3 INVERT-4  PHI 3  PHI 4
                               9790.010 1013.090    1     4     0   .013   100.000      .000  1014.500      .000 -45.000      .000
                                                                                                    RADIUS    ANGLE
                                                                                                     .000     .000
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
 ELEMENT NO  14 IS A REACH                *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                              10700.000 1019.670    1              .013                           .000     .000      .000      0
 ELEMENT NO  15 IS A REACH                *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                              11000.000 1021.870    1              .013                           .000     .000      .000      0
 ELEMENT NO  16 IS A REACH                *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                              11108.000 1022.300    1              .013                           .000     .000      .000      0
 ELEMENT NO  17 IS A JUNCTION             *         *     *     *                 *                *                 *
                    U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3        Q4     INVERT-3 INVERT-4  PHI 3  PHI 4
                              11108.010 1022.300    1     5     6   .013    64.000   118.000  1025.000 1025.000  45.000 -45.000
                                                                                                    RADIUS    ANGLE
                                                                                                     .000     .000
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
                                          W S P G W                                                                  PAGE NO   4
                          WATER SURFACE PROFILE - ELEMENT CARD LISTING
 ELEMENT NO  18 IS A REACH                *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                              12357.730 1027.300    1              .013                           .000     .000      .000      0
 ELEMENT NO  19 IS A REACH                *         *     *
                    U/S DATA   STATION    INVERT  SECT              N                          RADIUS    ANGLE     ANG PT  MAN H
                              12503.400 1027.860    1              .013                        212.001  -39.369      .000      0
 ELEMENT NO  20 IS A JUNCTION             *         *     *     *                 *                *                 *
                    U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3        Q4     INVERT-3 INVERT-4  PHI 3  PHI 4
                              12503.410 1028.860    8     7     1   .013    48.000   728.000  1029.920 1027.860  45.000      .000
                                                                                                    RADIUS    ANGLE
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                                                                                                                   .000      .000
ELEMENT NO  21 IS A REACH               *          *      *
                    U/S DATA   STATION     INVERT  SECT               N                                     RADIUS    ANGLE      ANG PT  MAN H
                              12528.300 1028.900    8               .013                                   47.536   30.000      .000     0
ELEMENT NO  22 IS A SYSTEM HEADWORKS                      *                       *
                    U/S DATA   STATION     INVERT  SECT                                               W S ELEV
                              12528.300 1028.900    8                                                1028.900
```

Program Package Serial Number: 1432

WATER SURFACE PROFILE LISTING Date: 1-16-2005 Time: 4: 2:35

FONTANA / JURUPA AVE. 14'x 9' RCB W/O DETENTION (AMC2)

100 YEAR STORM

JN 04339

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
7990.500	1005.500	10.640	1016.140	2004.00	15.90	3.93	1020.07	.00	8.60	14.00	9.000	14.000	.00	0 .0
12.570	.0024					.0051	.06	10.64	.93	9.00	.013	.00	.00	BOX
8003.070	1005.530	10.673	1016.203	2004.00	15.90	3.93	1020.13	.00	8.60	14.00	9.000	14.000	.00	0 .0
140.670	.0020					.0051	.71	.00	.93	9.00	.013	.00	.00	BOX
8143.740	1005.810	11.888	1017.698	2004.00	15.90	3.93	1021.63	.00	8.60	14.00	9.000	14.000	.00	0 .0
456.260	.0020					.0051	2.30	11.89	.93	9.00	.013	.00	.00	BOX
8600.000	1006.720	13.283	1020.003	2004.00	15.90	3.93	1023.93	.00	8.60	14.00	9.000	14.000	.00	0 .0
600.000	.0050					.0051	3.03	13.28	.93	7.51	.013	.00	.00	BOX
9200.000	1009.720	13.313	1023.033	2004.00	15.90	3.93	1026.96	.00	8.60	14.00	9.000	14.000	.00	0 .0
JUNCT STR	.0000					.0049	.00	13.31	.93		.013	.00	.00	BOX
9200.010	1009.720	13.543	1023.263	1971.00	15.64	3.80	1027.06	.00	8.51	14.00	9.000	14.000	.00	0 .0
479.990	.0050					.0049	2.35	13.54	.92	7.41	.013	.00	.00	BOX
9680.000	1012.120	13.489	1025.609	1971.00	15.64	3.80	1029.41	.00	8.51	14.00	9.000	14.000	.00	0 .0
90.000	.0090					.0049	.44	13.49	.92	5.96	.013	.00	.00	BOX
9770.000	1012.930	13.119	1026.049	1971.00	15.64	3.80	1029.85	.00	8.51	14.00	9.000	14.000	.00	0 .0
JUNCT STR	.0000					.0047	.00	13.12	.92		.013	.00	.00	BOX
9770.020	1012.930	13.314	1026.244	1943.00	15.42	3.69	1029.94	.00	8.43	14.00	9.000	14.000	.00	0 .0
JUNCT STR	.0000					.0041	.00	13.31	.91		.013	.00	.00	BOX

1691

Program Package Serial Number: 1432

WATER SURFACE PROFILE LISTING Date: 1-16-2005 Time: 4: 2:35

FONTANA / JURUPA AVE. 14'x 9' RCB W/O DETENTION (AMC2)
100 YEAR STORM
JN 04339

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT) / SF Ave	Water Elev / HF	Q (CFS) / SE Dpth	Vel (FPS) / Froude N	Vel Head / Norm Dp	Energy Grd.El. / "N"	Super Elev / X-Fall	Critical Depth / ZR	Flow Top Width / Type Ch	Height/Dia.-FT / No Wth Prs/Pip
9770.030	1012.930	13.981	1026.911	1805.00	14.33	3.19	1030.10	.00	8.02	14.00	9.000
19.970	.0080					.0041	.08	13.98	.84	5.83	.013
9790.000	1013.090	13.902	1026.992	1805.00	14.33	3.19	1030.18	.00	8.02	14.00	9.000
JUNCT STR	.0000					.0037	.00	13.90	.84		.013
9790.010	1013.090	14.500	1027.590	1705.00	13.53	2.84	1030.43	.00	7.72	14.00	9.000
909.990	.0072					.0037	3.33	14.50	.79	5.80	.013
10700.000	1019.670	11.248	1030.918	1705.00	13.53	2.84	1033.76	.00	7.72	14.00	9.000
300.000	.0073					.0037	1.10	11.25	.79	5.77	.013
11000.000	1021.870	10.145	1032.015	1705.00	13.53	2.84	1034.86	.00	7.72	14.00	9.000
108.000	.0040					.0037	.39	10.14	.79	7.24	.013
11108.000	1022.300	10.109	1032.409	1705.00	13.53	2.84	1035.25	.00	7.72	14.00	9.000
JUNCT STR	.0000					.0029	.00	10.11	.79		.013
11108.010	1022.300	11.049	1033.349	1523.00	12.09	2.27	1035.62	.00	7.16	14.00	9.000
1249.721	.0040					.0029	3.65	11.05	.71	6.64	.013
12357.730	1027.300	9.695	1036.995	1523.00	12.09	2.27	1039.26	.00	7.16	14.00	9.000
145.670	.0038					.0029	.43	.00	.71	6.74	.013
12503.400	1027.860	9.861	1037.721	1523.00	12.09	2.27	1039.99	.00	7.16	14.00	9.000
JUNCT STR *******						.0048	.00	.00	.71		.013

---------- WARNING - Junction Analysis - Change in Channel Type ----------

Program Package Serial Number: 1432

WATER SURFACE PROFILE LISTING Date: 1-16-2005 Time: 4: 2:35

FONTANA / JURUPA AVE. 14'x 9' RCB W/O DETENTION (AMC2)

100 YEAR STORM

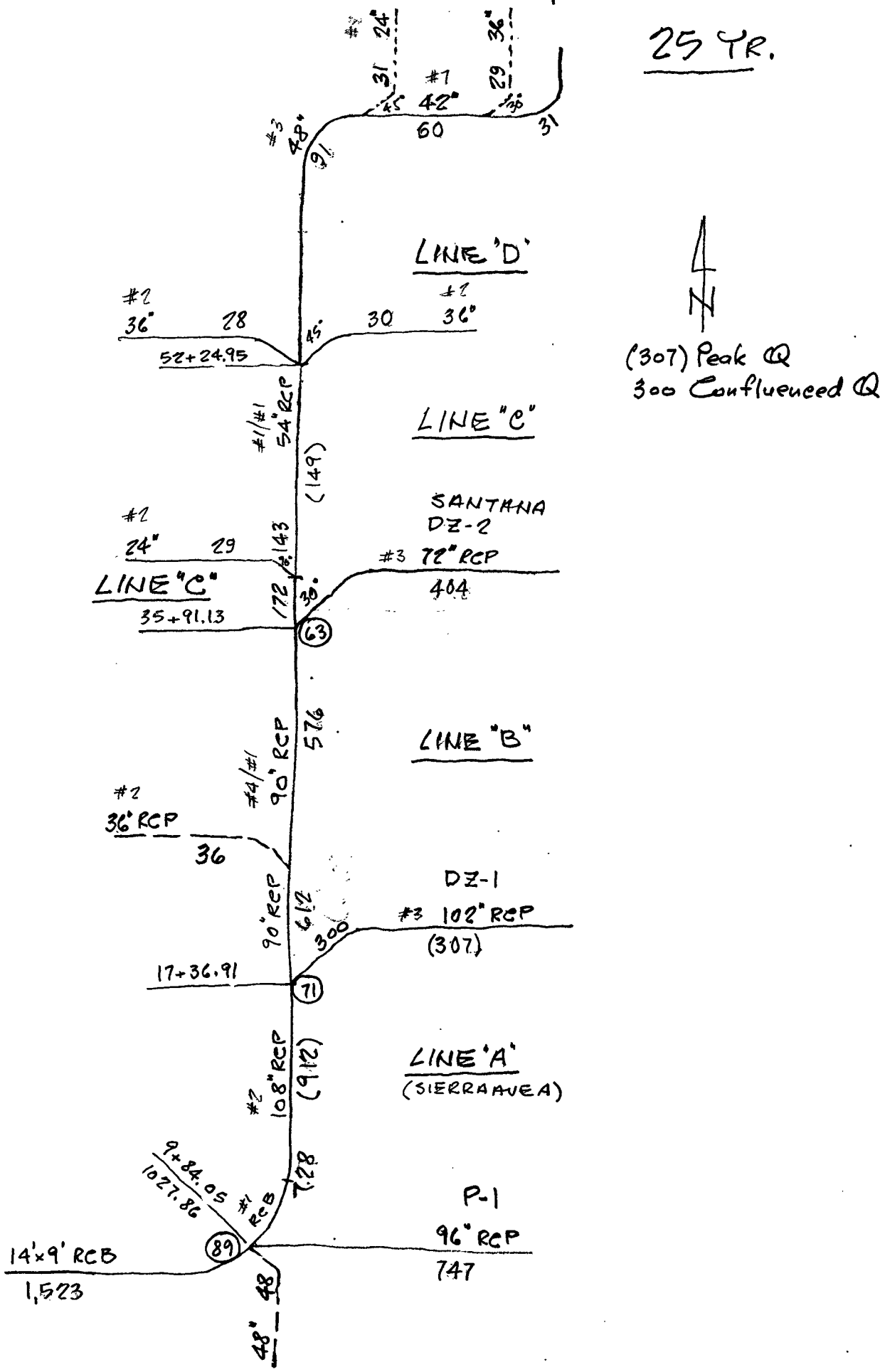
JN 04339

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
12503.410	1028.860	9.908	1038.768	747.00	14.86	3.43	1042.20	.00	6.87	.00	8.000	.000	.00	1 .0
24.890	.0016					.0067	.17	.00	.00	8.00	.013	.00	.00	PIPE
12528.300	1028.900	10.431	1039.331	747.00	14.86	3.43	1042.76	.00	6.87	.00	8.000	.000	.00	1 .0

JN04339
1662

SIERRA AVE. W/O DETENTION
FONTANA 7 (in computer)

25 YR.



```
T1 FONTANA / SIERRA AVE. LINE"A"
0
T2 25 YEAR STORM
T3 JN 04339
SO    984.0501027.860  1                          1038.770
R    1055.5801028.170  1      .013                              -19.332
.000 0
TS   1085.5801028.290  2      .014                               -8.108
R    1735.6001030.240  2      .013                                 .000
.000 0
JX   1757.8401031.790  4  3   .014  300.000         1030.640        30.0
.000
R    1757.8501031.790  4      .013                                 .000
.000 0
SH   1757.8501031.790  4                          1031.790
CD   1  3   0    .000   9.000   14.000  .000  .000   .00
CD   2  4   1    .000   9.000     .000  .000  .000   .00
CD   3  4   1    .000   8.500     .000  .000  .000   .00
CD   4  4   1    .000   7.500     .000  .000  .000   .00
Q           612.000   .0
```

FILE: SIERRAAVEA.WSW W S P G W - EDIT LISTING - Version 14.05 Date: 1-16-2005 Time: 4:58: 1

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	3	0	.000	9.000	14.000	.000	.000	.00										
CD	2	4	1		9.000														
CD	3	4	1		8.500														
CD	4	4	1		7.500														

W S P G W PAGE NO 1

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

FONTANA / SIERRA AVE. LINE"A"

HEADING LINE NO 2 IS -

25 YEAR STORM

HEADING LINE NO 3 IS -

JN 04339

W S P G W PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	984.050	1027.860	1	1038.770

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1055.580	1028.170	1	.013	211.999	-19.332	.000	0

ELEMENT NO 3 IS A TRANSITION * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE
	1085.580	1028.290	2	.014	211.997	-8.108

ELEMENT NO 4 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1735.600	1030.240	2	.013	.000	.000	.000	0

ELEMENT NO 5 IS A JUNCTION * * * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	1757.840	1031.790	4	3	0	.014	300.000	.000	1030.640	.000	30.000	.000

RADIUS	ANGLE
.000	.000

ELEMENT NO 6 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1757.850	1031.790	4	.013	.000	.000	.000	0

ELEMENT NO 7 IS A SYSTEM HEADWORKS * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1757.850	1031.790	4	1031.790

1664

W S P G W - CIVILDESIGN Version 14.05

Program Package Serial Number: 1432

WATER SURFACE PROFILE LISTING

Date: 1-16-2005 Time: 4:57:20

FONTANA / SIERRA AVE. LINE"A"
25 YEAR STORM
JN 04339

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
984.050	1027.860	10.910	1038.770	912.00	7.24	.81	1039.58	.00	5.09	14.00	9.000	14.000	.00	0 .0
71.530	.0043					.0010	.07	.00	.43	4.44	.013	.00	.00	BOX
1055.580	1028.170	10.750	1038.920	912.00	7.24	.81	1039.73	.00	5.09	14.00	9.000	14.000	.00	0 .0
TRANS STR	.0040					.0034	.10	.00	.43		.014	.00	.00	BOX
1085.580	1028.290	8.801	1037.091	912.00	14.42	3.23	1040.32	.00	7.42	2.65	9.000	.000	.00	1 .0
83.053	.0030					.0050	.41	8.80	.52	9.00	.013	.00	.00	PIPE
1168.633	1028.539	9.000	1037.539	912.00	14.34	3.19	1040.73	.00	7.42	.00	9.000	.000	.00	1 .0
566.967	.0030					.0053	2.98	9.00	.00	9.00	.013	.00	.00	PIPE
1735.600	1030.240	10.324	1040.564	912.00	14.34	3.19	1043.76	.00	7.42	.00	9.000	.000	.00	1 .0
JUNCT STR	.0697					.0068	.15	10.32	.00		.014	.00	.00	PIPE
1757.840	1031.790	10.781	1042.571	612.00	13.85	2.98	1045.55	.00	6.34	.00	7.500	.000	.00	1 .0
.010	.0000					.0064	.00	10.78	.00	.00	.013	.00	.00	PIPE
1757.850	1031.790	10.781	1042.572	612.00	13.85	2.98	1045.55	.00	6.34	.00	7.500	.000	.00	1 .0

```
T1 FONTANA / SIERRA AVE. LINE"B"
0
T2 25 YEAR STORM
T3 JN 04339
SO    1757.8501031.790  1                                1042.570
R     2441.5001034.530  1       .013                                    .000
.000 0
JX    2441.5101034.530  1  2    .013    36.000          1039.150        -90.0
.000
R     3590.5801039.120  1       .013                                    .000
.000 0
JX    3607.6501039.990  4  3    .014   172.000          1042.180          .0
30.000
R     3607.6601039.990  4       .013                                    .000
.000 0
SH    3607.6601039.990  4                                1039.990
CD    1  4    1     .000    7.500      .000  .000  .000   .00
CD    2  4    1     .000    3.000      .000  .000  .000   .00
CD    3  4    1     .000    4.500      .000  .000  .000   .00
CD    4  4    1     .000    6.000      .000  .000  .000   .00
Q             404.000    .0
```

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	4	1		7.500														
CD	2	4	1		3.000														
CD	3	4	1		4.500														
CD	4	4	1		6.000														

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -
FONTANA / SIERRA AVE. LINE"B"

HEADING LINE NO 2 IS -
25 YEAR STORM

HEADING LINE NO 3 IS -
JN 04339

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1757.850	1031.790	1	1042.570

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2441.500	1034.530	1	.013	.000	.000	.000	0

ELEMENT NO 3 IS A JUNCTION * * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	2441.510	1034.530	1	2	0	.013	36.000	.000	1039.150	.000	-90.000	.000

RADIUS	ANGLE
.000	.000

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 4 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3590.580	1039.120	1	.013	.000	.000	.000	0

ELEMENT NO 5 IS A JUNCTION * * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	3607.650	1039.990	4	3	0	.014	172.000	.000	1042.180	.000	.000	.000

RADIUS	ANGLE
32.601	30.000

ELEMENT NO 6 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3607.660	1039.990	4	.013	.000	.000	.000	0

ELEMENT NO 7 IS A SYSTEM HEADWORKS * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	3607.660	1039.990	4	1039.990

Program Package Serial Number: 1432

WATER SURFACE PROFILE LISTING Date: 1-16-2005 Time: 5: 4: 0

FONTANA / SIERRA AVE. LINE"B"
25 YEAR STORM
JN 04339

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1757.850	1031.790	10.780	1042.570	612.00	13.85	2.98	1045.55	.00	6.34	.00	7.500	.000	.00	1 .0
683.650	.0040					.0064	4.34	10.78	.00	7.50	.013	.00	.00	PIPE
2441.500	1034.530	12.383	1046.913	612.00	13.85	2.98	1049.89	.00	6.34	.00	7.500	.000	.00	1 .0
JUNCT STR	.0000					.0060	.00	12.38	.00		.013	.00	.00	PIPE
2441.510	1034.530	13.063	1047.593	576.00	13.04	2.64	1050.23	.00	6.18	.00	7.500	.000	.00	1 .0
1149.070	.0040					.0056	6.47	13.06	.00	7.50	.013	.00	.00	PIPE
3590.580	1039.120	14.939	1054.059	576.00	13.04	2.64	1056.70	.00	6.18	.00	7.500	.000	.00	1 .0
JUNCT STR	.0510					.0085	.15	.00	.00		.014	.00	.00	PIPE
3607.650	1039.990	14.109	1054.099	404.00	14.29	3.17	1057.27	.00	5.35	.00	6.000	.000	.00	1 .0
.010	.0000					.0091	.00	14.11	.00	.00	.013	.00	.00	PIPE
3607.660	1039.990	14.109	1054.099	404.00	14.29	3.17	1057.27	.00	5.35	.00	6.000	.000	.00	1 .0

```
T1 FONTANA / SIERRA AVE. LINE"C"
0
T2 25 YEAR STORM
T3 JN 04339
SO    3607.3301042.180  1                                1054.100
R     3787.6901051.310  1       .013                                    .000
.000 0
JX    3794.3501051.480  1  2    .014    29.000           1052.860        -85.0
.000
R     3794.3601051.480  1       .013                                    .000
.000 0
SH    3794.3601051.480  1                                1051.480
CD    1  4    1     .000    4.500      .000  .000  .000    .00
CD    2  4    1     .000    2.000      .000  .000  .000    .00
Q             149.000    .0
```

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	4	1		4.500														
CD	2	4	1		2.000														

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -
FONTANA / SIERRA AVE. LINE"C"

HEADING LINE NO 2 IS -
25 YEAR STORM

HEADING LINE NO 3 IS -
JN 04339

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	3607.330	1042.180	1	1054.100

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3787.690	1051.310	1	.013	.000	.000	.000	0

ELEMENT NO 3 IS A JUNCTION * * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	3794.350	1051.480	1	2	0	.014	29.000	.000	1052.860	.000	-85.000	.000

RADIUS	ANGLE
.000	.000

ELEMENT NO 4 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3794.360	1051.480	1	.013	.000	.000	.000	0

ELEMENT NO 5 IS A SYSTEM HEADWORKS * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	3794.360	1051.480	1	1051.480

Program Package Serial Number: 1432

WATER SURFACE PROFILE LISTING Date: 1-16-2005 Time: 5:21:58

FONTANA / SIERRA AVE. LINE"C"
25 YEAR STORM
JN 04339

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
3607.330	1042.180	11.920	1054.100	178.00	11.19	1.95	1056.05	.00	3.87	.00	4.500	.000	.00	1 .0
174.884	.0506					.0081	1.42	11.92	.00	1.99	.013	.00	.00	PIPE
3782.214	1051.033	4.500	1055.533	178.00	11.19	1.95	1057.48	.00	3.87	.00	4.500	.000	.00	1 .0
5.173	.0506					.0076	.04	4.50	.00	1.99	.013	.00	.00	PIPE
3787.386	1051.295	4.082	1055.377	178.00	11.74	2.14	1057.52	.00	3.87	2.61	4.500	.000	.00	1 .0
.303	.0506					.0072	.00	4.08	.86	1.99	.013	.00	.00	PIPE
3787.690	1051.310	4.025	1055.335	178.00	11.86	2.18	1057.52	.00	3.87	2.77	4.500	.000	.00	1 .0
JUNCT STR	.0255					.0075	.05	4.02	.90		.014	.00	.00	PIPE
3794.350	1051.480	5.295	1056.775	149.00	9.37	1.36	1058.14	.00	3.58	.00	4.500	.000	.00	1 .0
.010	.0000					.0057	.00	5.30	.00	.00	.013	.00	.00	PIPE
3794.360	1051.480	5.295	1056.775	149.00	9.37	1.36	1058.14	.00	3.58	.00	4.500	.000	.00	1 .0

```
T1 FONTANA / SIERRA AVE. LINE"D"
0
T2 25 YEAR STORM
T3 JN 04339
SO   3794.3601051.480  1                                  1056.780
R    5219.3701065.020  1      .013                                    .000
.000 0
JX   5227.2801055.560  3  2  2.014   30.000   28.0001066.2001066.200 45.0-45.0
.000
R    5602.4801069.340  5      .013                                    .000
.000 0
JX   5607.1401069.880  7      .014
R    6270.8101076.000  7      .013                                    .000
.000 0
R    6343.0401076.740  7      .013                                  91.966
.000 0
R    6358.1601076.720  7      .013                                    .000
.000 0
JX   6362.8301076.740  7  8   .014   31.000         1077.500         -45.0
.000
R    6763.1801078.340  7      .013                                    .000
.000 0
JX   6773.1801078.370  7  2   .014   29.000         1078.650         -30.0
.000
R    7239.9301080.330  7      .013                                    .000
.000 0
R    7373.4301081.000  7      .013                                    .000
.000 0
R    7387.9301081.070  7      .013                                    .000
.000 0
SH   7387.9301081.070  7                                 1081.070
CD   1  4   1    .000   4.500     .000  .000  .000   .00
CD   2  4   1    .000   3.000     .000  .000  .000   .00
CD   3  4   1    .000   4.000     .000  .000  .000   .00
CD   5  4   1    .000   4.000     .000  .000  .000   .00
CD   7  4   1    .000   3.500     .000  .000  .000   .00
CD   8  4   1    .000   2.000     .000  .000  .000   .00
Q            31.000   .0
```

CARD CODE	SECT NO	CHN TYPE	NO OF PIER/PIP	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	4	1		4.500														
CD	2	4	1		3.000														
CD	3	4	1		4.000														
CD	5	4	1		4.000														
CD	7	4	1		3.500														
CD	8	4	1		2.000														

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

FONTANA / SIERRA AVE. LINE"D"

HEADING LINE NO 2 IS -

25 YEAR STORM

HEADING LINE NO 3 IS -

JN 04339

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	3794.360	1051.480	1	1056.780

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	5219.370	1065.020	1	.013	.000	.000	.000	0

ELEMENT NO 3 IS A JUNCTION * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	5227.280	1055.560	3	2	2	.014	30.000	28.000	1066.200	1066.200	45.000	-45.000

RADIUS	ANGLE
.000	.000

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
WARNING - ADJACENT SECTIONS ARE NOT IDENTICAL - SEE SECTION NUMBERS AND CHANNEL DEFINITIONS

ELEMENT NO 4 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	5602.480	1069.340	5	.013	.000	.000	.000	0

ELEMENT NO 5 IS A JUNCTION * * * * * *

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	5607.140	1069.880	7	0	0	.014	.000	.000	.000	.000	.000	.000

RADIUS	ANGLE
.000	.000

ELEMENT NO 6 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	6270.810	1076.000	7	.013	.000	.000	.000	0

ELEMENT NO 7 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	6343.040	1076.740	7	.013	45.000	91.966	.000	0

ELEMENT NO 8 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	6358.160	1076.720	7	.013	.000	.000	.000	0

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 9 IS A JUNCTION * * * * * * *

```
                     U/S DATA    STATION     INVERT  SECT LAT-1 LAT-2   N       Q3        Q4      INVERT-3 INVERT-4  PHI 3  PHI 4
                                 6362.830 1076.740    7     8     0   .014    31.000       .000  1077.500      .000 -45.000      .000
                                                                                                     RADIUS    ANGLE
                                                                                                       .000     .000
                                                           W S P G W                                                     PAGE NO   3
                             WATER SURFACE PROFILE - ELEMENT CARD LISTING
ELEMENT NO  10 IS A REACH             *         *     *
                     U/S DATA    STATION     INVERT  SECT               N                                RADIUS    ANGLE     ANG PT  MAN H
                                 6763.180 1078.340    7               .013                                 .000     .000      .000     0
ELEMENT NO  11 IS A JUNCTION          *         *     *     *                   *                   *               *
                     U/S DATA    STATION     INVERT  SECT LAT-1 LAT-2   N       Q3        Q4      INVERT-3 INVERT-4  PHI 3  PHI 4
                                 6773.180 1078.370    7     2     0   .014    29.000       .000  1078.650      .000 -30.000      .000
                                                                                                     RADIUS    ANGLE
                                                                                                       .000     .000
ELEMENT NO  12 IS A REACH             *         *     *
                     U/S DATA    STATION     INVERT  SECT               N                                RADIUS    ANGLE     ANG PT  MAN H
                                 7239.930 1080.330    7               .013                                 .000     .000      .000     0
ELEMENT NO  13 IS A REACH             *         *     *
                     U/S DATA    STATION     INVERT  SECT               N                                RADIUS    ANGLE     ANG PT  MAN H
                                 7373.430 1081.000    7               .013                                 .000     .000      .000     0
ELEMENT NO  14 IS A REACH             *         *     *
                     U/S DATA    STATION     INVERT  SECT               N                                RADIUS    ANGLE     ANG PT  MAN H
                                 7387.930 1081.070    7               .013                                 .000     .000      .000     0
ELEMENT NO  15 IS A SYSTEM HEADWORKS                  *                       *
                     U/S DATA    STATION     INVERT  SECT                                         W S ELEV
                                 7387.930 1081.070    7                                          1081.070
```

Program Package Serial Number: 1432

WATER SURFACE PROFILE LISTING Date: 1-16-2005 Time: 5:33:13

FONTANA / SIERRA AVE. LINE"D"
25 YEAR STORM
JN 04339

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
3794.360	1051.480	5.300	1056.780	149.00	9.37	1.36	1058.14	.00	3.58	.00	4.500	.000	.00	1 .0
212.739	.0095					.0057	1.21	5.30	.00	2.98	.013	.00	.00	PIPE
4007.099	1053.501	4.500	1058.001	149.00	9.37	1.36	1059.36	.00	3.58	.00	4.500	.000	.00	1 .0
44.426	.0095					.0053	.24	4.50	.00	2.98	.013	.00	.00	PIPE
4051.525	1053.923	4.258	1058.182	149.00	9.57	1.42	1059.60	.00	3.58	2.03	4.500	.000	.00	1 .0
HYDRAULIC JUMP														
4051.525	1053.923	2.982	1056.905	149.00	13.32	2.75	1059.66	.00	3.58	4.26	4.500	.000	.00	1 .0
620.664	.0095					.0095	5.90	2.98	1.45	2.98	.013	.00	.00	PIPE
4672.188	1059.821	2.982	1062.803	149.00	13.32	2.75	1065.56	.00	3.58	4.26	4.500	.000	.00	1 .0
259.206	.0095					.0095	2.45	2.98	1.45	2.98	.013	.00	.00	PIPE
4931.395	1062.284	2.988	1065.272	149.00	13.28	2.74	1068.01	.00	3.58	4.25	4.500	.000	.00	1 .0
203.938	.0095					.0089	1.82	2.99	1.44	2.98	.013	.00	.00	PIPE
5135.333	1064.221	3.119	1067.341	149.00	12.67	2.49	1069.83	.00	3.58	4.15	4.500	.000	.00	1 .0
55.949	.0095					.0080	.45	3.12	1.33	2.98	.013	.00	.00	PIPE
5191.282	1064.753	3.259	1068.012	149.00	12.08	2.26	1070.28	.00	3.58	4.02	4.500	.000	.00	1 .0
22.196	.0095					.0071	.16	3.26	1.22	2.98	.013	.00	.00	PIPE
5213.478	1064.964	3.412	1068.376	149.00	11.51	2.06	1070.44	.00	3.58	3.85	4.500	.000	.00	1 .0
5.892	.0095					.0064	.04	3.41	1.11	2.98	.013	.00	.00	PIPE

Program Package Serial Number: 1432

WATER SURFACE PROFILE LISTING Date: 1-16-2005 Time: 5:33:13

FONTANA / SIERRA AVE. LINE"D"
25 YEAR STORM
JN 04339

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
5219.370	1065.020	3.582	1068.602	149.00	10.98	1.87	1070.47	.00	3.58	3.63	4.500	.000	.00	1 .0
JUNCT STR -1.1960						.0058	.05	3.58	1.00		.014	.00	.00	PIPE
5227.280	1055.560	15.222	1070.782	91.00	7.24	.81	1071.60	.00	2.89	.00	4.000	.000	.00	1 .0
331.015	.0367					.0040	1.33	15.22	.00	1.58	.013	.00	.00	PIPE
5558.295	1067.717	4.393	1072.110	91.00	7.24	.81	1072.92	.00	2.89	.00	4.000	.000	.00	1 .0
HYDRAULIC JUMP														
5558.295	1067.717	1.816	1069.533	91.00	16.40	4.18	1073.71	.00	2.89	3.98	4.000	.000	.00	1 .0
15.944	.0367					.0213	.34	1.82	2.45	1.58	.013	.00	.00	PIPE
5574.239	1068.303	1.869	1070.172	91.00	15.79	3.87	1074.05	.00	2.89	3.99	4.000	.000	.00	1 .0
15.945	.0367					.0190	.30	1.87	2.32	1.58	.013	.00	.00	PIPE
5590.184	1068.888	1.939	1070.827	91.00	15.06	3.52	1074.35	.00	2.89	4.00	4.000	.000	.00	1 .0
12.296	.0367					.0168	.21	1.94	2.16	1.58	.013	.00	.00	PIPE
5602.480	1069.340	2.014	1071.354	91.00	14.36	3.20	1074.56	.00	2.89	4.00	4.000	.000	.00	1 .0
JUNCT STR .1159						.0144	.07	2.01	2.01		.014	.00	.00	PIPE
5607.140	1069.880	2.702	1072.582	91.00	11.42	2.02	1074.61	.00	2.96	2.94	3.500	.000	.00	1 .0
522.263	.0092					.0092	4.82	2.70	1.22	2.70	.013	.00	.00	PIPE
6129.403	1074.696	2.702	1077.398	91.00	11.42	2.02	1079.42	.00	2.96	2.94	3.500	.000	.00	1 .0
141.407	.0092					.0094	1.33	2.70	1.22	2.70	.013	.00	.00	PIPE

Program Package Serial Number: 1432

WATER SURFACE PROFILE LISTING Date: 1-16-2005 Time: 5:33:13

FONTANA / SIERRA AVE. LINE"D"
25 YEAR STORM
JN 04339

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
6270.810	1076.000	2.649	1078.649	91.00	11.65	2.11	1080.76	.28	2.96	3.00	3.500	.000	.00	1 .0
19.022	.0102					.0095	.18	2.93	1.27	2.58	.013	.00	.00	PIPE
6289.833	1076.195	2.671	1078.866	91.00	11.55	2.07	1080.94	.27	2.96	2.98	3.500	.000	.00	1 .0
44.009	.0102					.0090	.40	2.94	1.25	2.58	.013	.00	.00	PIPE
6333.842	1076.646	2.804	1079.450	91.00	11.01	1.88	1081.33	.23	2.96	2.79	3.500	.000	.00	1 .0
9.198	.0102					.0082	.07	3.04	1.13	2.58	.013	.00	.00	PIPE
6343.040	1076.740	2.957	1079.697	91.00	10.49	1.71	1081.41	.00	2.96	2.53	3.500	.000	.00	1 .0
1.916	-.0013					.0075	.01	2.96	1.00	.00	.013	.00	.00	PIPE
6344.956	1076.737	3.105	1079.842	91.00	10.09	1.58	1081.42	.00	2.96	2.22	3.500	.000	.00	1 .0
6.074	-.0013					.0072	.04	3.10	.88	.00	.013	.00	.00	PIPE
6351.030	1076.729	3.260	1079.990	91.00	9.75	1.48	1081.47	.00	2.96	1.77	3.500	.000	.00	1 .0
7.130	-.0013					.0071	.05	3.26	.75	.00	.013	.00	.00	PIPE
6358.160	1076.720	3.375	1080.095	91.00	9.57	1.42	1081.52	.00	2.96	1.30	3.500	.000	.00	1 .0
JUNCT STR	.0043					.0062	.03	3.38	.62		.014	.00	.00	PIPE
6362.830	1076.740	4.293	1081.033	60.00	6.24	.60	1081.64	.00	2.43	.00	3.500	.000	.00	1 .0
400.350	.0040					.0036	1.42	4.29	.00	2.71	.013	.00	.00	PIPE
6763.180	1078.340	4.117	1082.457	60.00	6.24	.60	1083.06	.00	2.43	.00	3.500	.000	.00	1 .0
JUNCT STR	.0030					.0026	.03	4.12	.00		.014	.00	.00	PIPE

FONTANA / SIERRA AVE. LINE"D"
25 YEAR STORM
JN 04339

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
6773.180	1078.370	4.666	1083.036	31.00	3.22	.16	1083.20	.00	1.72	.00	3.500	.000	.00	1 .0
358.822	.0042					.0009	.34	4.67	.00	1.70	.013	.00	.00	PIPE
7132.002	1079.877	3.500	1083.377	31.00	3.22	.16	1083.54	.00	1.72	.00	3.500	.000	.00	1 .0
92.816	.0042					.0009	.08	3.50	.00	1.70	.013	.00	.00	PIPE
7224.818	1080.266	3.175	1083.442	31.00	3.38	.18	1083.62	.00	1.72	2.03	3.500	.000	.00	1 .0
15.112	.0042					.0008	.01	3.18	.28	1.70	.013	.00	.00	PIPE
7239.930	1080.330	3.120	1083.450	31.00	3.42	.18	1083.63	.00	1.72	2.18	3.500	.000	.00	1 .0
38.474	.0050					.0009	.03	3.12	.30	1.61	.013	.00	.00	PIPE
7278.404	1080.523	2.942	1083.465	31.00	3.59	.20	1083.67	.00	1.72	2.56	3.500	.000	.00	1 .0
31.728	.0050					.0010	.03	2.94	.34	1.61	.013	.00	.00	PIPE
7310.132	1080.682	2.793	1083.475	31.00	3.77	.22	1083.70	.00	1.72	2.81	3.500	.000	.00	1 .0
27.727	.0050					.0011	.03	2.79	.39	1.61	.013	.00	.00	PIPE
7337.858	1080.822	2.661	1083.483	31.00	3.95	.24	1083.72	.00	1.72	2.99	3.500	.000	.00	1 .0
24.883	.0050					.0012	.03	2.66	.43	1.61	.013	.00	.00	PIPE
7362.741	1080.946	2.541	1083.488	31.00	4.14	.27	1083.75	.00	1.72	3.12	3.500	.000	.00	1 .0
10.689	.0050					.0013	.01	2.54	.47	1.61	.013	.00	.00	PIPE
7373.430	1081.000	2.489	1083.489	31.00	4.24	.28	1083.77	.00	1.72	3.17	3.500	.000	.00	1 .0
14.500	.0048					.0013	.02	2.49	.49	1.63	.013	.00	.00	PIPE

Program Package Serial Number: 1432

WATER SURFACE PROFILE LISTING Date: 1-16-2005 Time: 5:33:13

FONTANA / SIERRA AVE. LINE"D"
25 YEAR STORM
JN 04339

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
7387.930	1081.070	2.422	1083.492	31.00	4.36	.30	1083.79	.00	1.72	3.23	3.500	.000	.00	1 .0

◆ LAND PLANNING ◆ CIVIL ENGINEERING ◆ SURVEYING

FONTANA

JOB No. 04339
BY HERMAN
DATE 1/19/05
SHT. 99
OF

HYDRAULICS

FOR INDIVIDUAL PIPES

Hall & Foreman, Inc.

Subject CHECK MASTER PLAN
STORM DRAIN PIPE SIZES

By HERMAN

Dept. IRVINE

Date 8/6/04

Project Name FONTANA

Project No. 04339

Page No. (1) of

NODES	ΔH	L	S	Q_{25}	Given Size	?	Proposed Size
* DZ-7A							
55-54	1.7	340	0.0045	125	63"	✓	
54-53	4.3	860	0.0045	112	60"	✓	
53-52	2.5	500	0.0045	82	42"	×	48"
52-116	7.7	650	0.0108	51	39"	✓	
* DZ-2							
63-57	1.8	560	0.0029	404	87"	✓	
57-56	2.0	640	0.0029	343	84"	✓	
56-55	3.2	1,000	0.0029	259	78"	✓	
55-51	8.9	900	0.009	70	42"	✓	
51-50	8.2	1,320	0.0056	49	39"	✓	
• 50-102	5.8	460	0.0117		24"	Built	
• 50-105	4.3	570	0.0068		30"	Built	
* DZ-1							
71-70	4.0	800	0.0045	* 408	102"	✓	
70-69	4.2	880	0.0043	* 280	102"	✓	
69-68	2.0	400	0.0045	* 250	93"	✓	
68-67	3.8	760	0.0045	* 160	84"	✓	
67-66	3.8	760	0.0045	* 131	75"	✓	
66-65	3.3	660	0.0045	* 67	57"	✓	
65-302	3.3	660	0.0045	* 49	36"	×	42"
70-331	4.0	800	0.0045	* 71	42"	✓	
68-319	13.0	900	0.0126	* 75	48"	✓	
* DZ-4							
90-45	15.0	750	0.018	104	42"	✓	
45-607	6.0	660	0.0081	70	36"	×	42"

Hall & Foreman, Inc.

Subject _____ Date _____

Project Name _____

By _____ Project No. _____

Dept. _____ Page No. 2 of _____

* DZ-4A								
91-46	11.5	750	0.0135	79	42"	✓		
46-629	7.3	660	0.0099	52	36"	✓		
* DZ-6								
35-34	6.2	660	0.0085	167	39"	×	54"	
34-33	12.8	990	0.0117	122	39"	×	48"	
33-717	14.0	990	0.0126	71	39"	✓		
* DZ-7								
38-37	5.5	660	0.0075	153	42"	×	54"	
37-36	10.5	990	0.0095	118	42"	×	48"	
36-803	15.0	990	0.0135	68	42"	✓		
* DZ-5								
94-40	7.3	900	0.0072		102"	Built		
40-39	13.8	1,720	0.0072	* 707	84"	×	96"	
39-38	8.4	990	0.0077	* 680	84"	×	90"	
38-35	8.0	1,320	0.0054	* 444	84"	✓		
35-32	11.0	1,320	0.0075	146	51"	✓		
32-31	4.6	660	0.0063	119	39"	×	48"	
31-30	3.8	990	0.0034	82	39"	×	48"	
30-704	10.0	990	0.0101	56	36"	✓		

*722 Indicates Q_{100}

LINE "DZ-2A"

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: FONTANA / JN 04339

Comment: DZ-2A / INDIVIDUAL PIPE 55-54

Solve For Actual Depth

Given Input Data:

Diameter.....	5.25 ft
Slope.....	0.0045 ft/ft
Manning's n.....	0.013
Discharge.....	123.00 cfs

Computed Results:

Depth.....	2.99 ft
Velocity.....	9.67 fps
Flow Area.....	12.71 sf
Critical Depth....	3.13 ft
Critical Slope....	0.0039 ft/ft
Percent Full.....	56.88 %
Full Capacity.....	198.99 cfs
QMAX @.94D.....	214.05 cfs
Froude Number.....	1.09 (flow is Supercritical)

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: FONTANA / JN 04339

Comment: DZ-2A / INDIVIDUAL PIPE 54-53

Solve For Actual Depth

Given Input Data:

Diameter.....	5.00 ft
Slope.....	0.0045 ft/ft
Manning's n.....	0.013
Discharge.....	109.00 cfs

Computed Results:

Depth.....	2.86 ft
Velocity.....	9.38 fps
Flow Area.....	11.61 sf
Critical Depth....	2.98 ft
Critical Slope....	0.0040 ft/ft
Percent Full.....	57.21 %
Full Capacity.....	174.71 cfs
QMAX @.94D.....	187.94 cfs
Froude Number.....	1.08 (flow is Supercritical)

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: FONTANA / JN 04339

Comment: DZ-2A / INDIVIDUAL PIPE 53-52

Solve For Actual Depth

Given Input Data:

Diameter.....	4.00 ft
Slope.....	0.0045 ft/ft
Manning's n.....	0.013
Discharge.....	80.00 cfs

Computed Results:

Depth.....	2.78 ft
Velocity.....	8.57 fps
Flow Area.....	9.33 sf
Critical Depth....	2.71 ft
Critical Slope....	0.0048 ft/ft
Percent Full.....	69.55 %
Full Capacity.....	96.36 cfs
QMAX @.94D.....	103.65 cfs
Froude Number.....	0.95 (flow is Subcritical)

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: FONTANA / JN 04339

Comment: DZ-2A / INDIVIDUAL PIPE 52-116

Solve For Actual Depth

Given Input Data:

Diameter.....	3.75 ft
Slope.....	0.0108 ft/ft
Manning's n.....	0.013
Discharge.....	49.00 cfs

Computed Results:

Depth.....	1.63 ft
Velocity.....	10.67 fps
Flow Area.....	4.59 sf
Critical Depth....	2.14 ft
Critical Slope....	0.0042 ft/ft
Percent Full.....	43.36 %
Full Capacity.....	125.68 cfs
QMAX @.94D.....	135.19 cfs
Froude Number.....	1.69 (flow is Supercritical)

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LINE "DZ-2"

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: FONTANA / JN 04339

Comment: DZ-2 / INDIVIDUAL PIPE 63-57

Solve For Actual Depth

Given Input Data:

Diameter.....	7.25 ft
Slope.....	0.0029 ft/ft
Manning's n.....	0.013
Discharge.....	398.00 cfs

Computed Results:

Depth.....	6.37 ft
Velocity.....	10.35 fps
Flow Area.....	38.44 sf
Critical Depth....	5.21 ft
Critical Slope....	0.0043 ft/ft
Percent Full.....	87.91 %
Full Capacity.....	377.77 cfs
QMAX @.94D.....	406.37 cfs
Froude Number.....	0.64 (flow is Subcritical)

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: FONTANA / JN 04339

Comment: DZ-2 / INDIVIDUAL PIPE 57-56

Solve For Actual Depth

Given Input Data:

Diameter.....	7.00 ft
Slope.....	0.0029 ft/ft
Manning's n.....	0.013
Discharge.....	339.00 cfs

Computed Results:

Depth.....	5.65 ft
Velocity.....	10.19 fps
Flow Area.....	33.27 sf
Critical Depth....	4.85 ft
Critical Slope....	0.0041 ft/ft
Percent Full.....	80.67 %
Full Capacity.....	344.02 cfs
QMAX @.94D.....	370.07 cfs
Froude Number.....	0.73 (flow is Subcritical)

Open Channel Flow Module, Version 3.43 (c) 1991
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Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: FONTANA / JN 04339

Comment: DZ-2 / INDIVIDUAL PIPE 56-55

Solve For Actual Depth

Given Input Data:

Diameter.....	6.50 ft
Slope.....	0.0029 ft/ft
Manning's n.....	0.013
Discharge.....	256.00 cfs

Computed Results:

Depth.....	4.85 ft
Velocity.....	9.64 fps
Flow Area.....	26.56 sf
Critical Depth....	4.29 ft
Critical Slope....	0.0040 ft/ft
Percent Full.....	74.64 %
Full Capacity.....	282.33 cfs
QMAX @.94D.....	303.71 cfs
Froude Number.....	0.78 (flow is Subcritical)

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