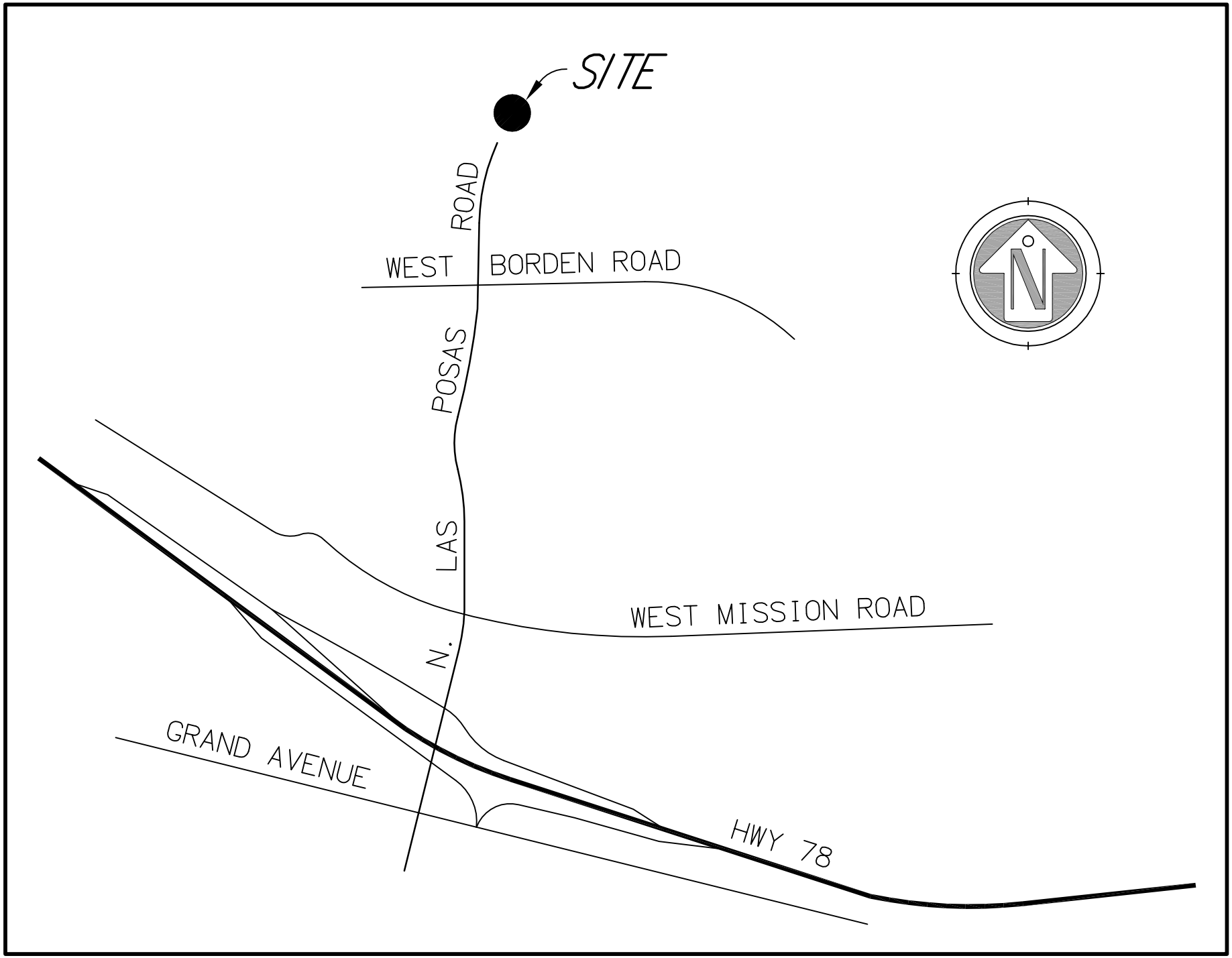
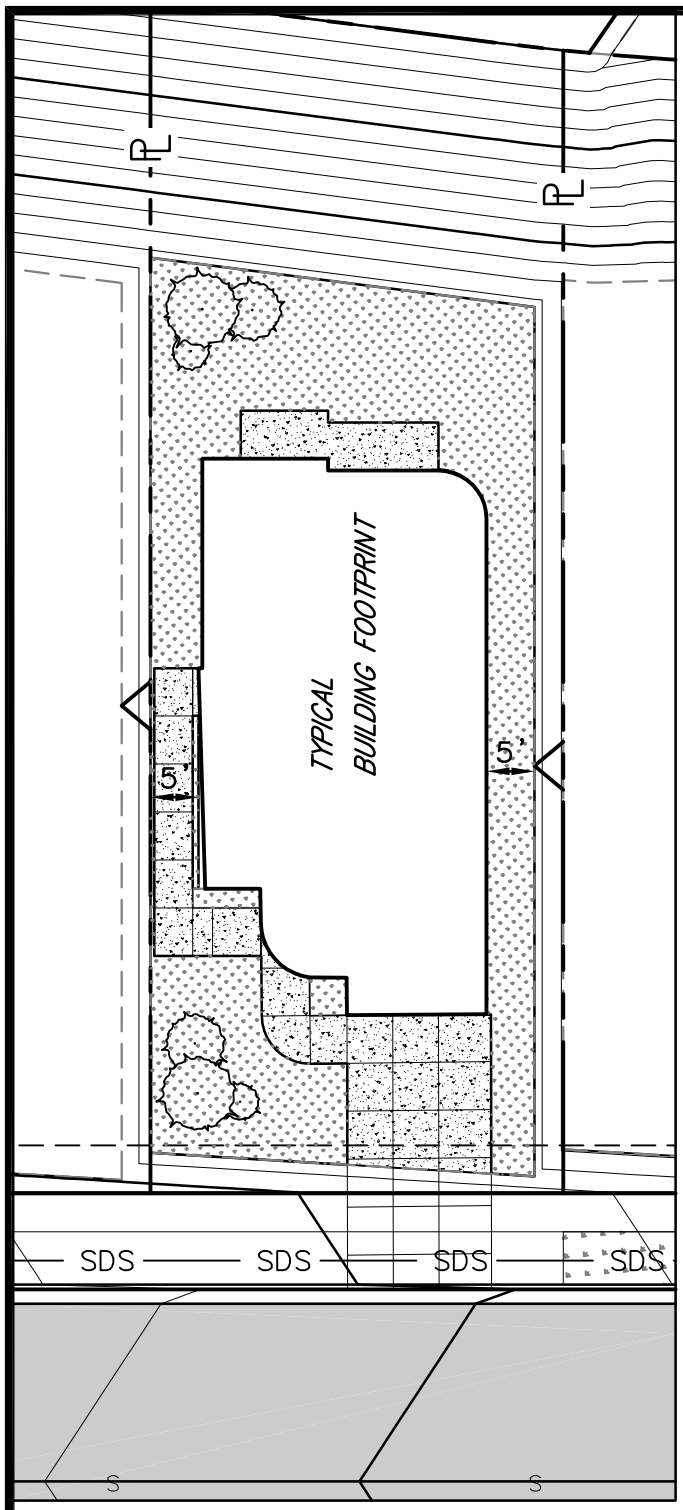
APPENDIX 1

VICINITY MAP AND IMPERVIOUS SURFACE EXHIBIT




VICINITY MAP
NOT TO SCALE




**IMPERVIOUS SURFACE**

BUILDING FOOTPRINT=1576 SF
DRIVEWAY & PATHWAY =465 SF
PATIO =103 SF
TOTAL IMPERVIOUS SURFACE=2144 SF
EFFECTIVE LOT SURFACE (EXCLUDE THE SLOPE) =3676 SF

**PERCENTAGE OF IMPERVIOUS:**

$\frac{2144\ SF}{3676\ SF}$ =58% IMPERVIOUS

THEREFORE WE USE 60% IMPERVIOUS AREA ASSUMPTION FOR ALL PADS

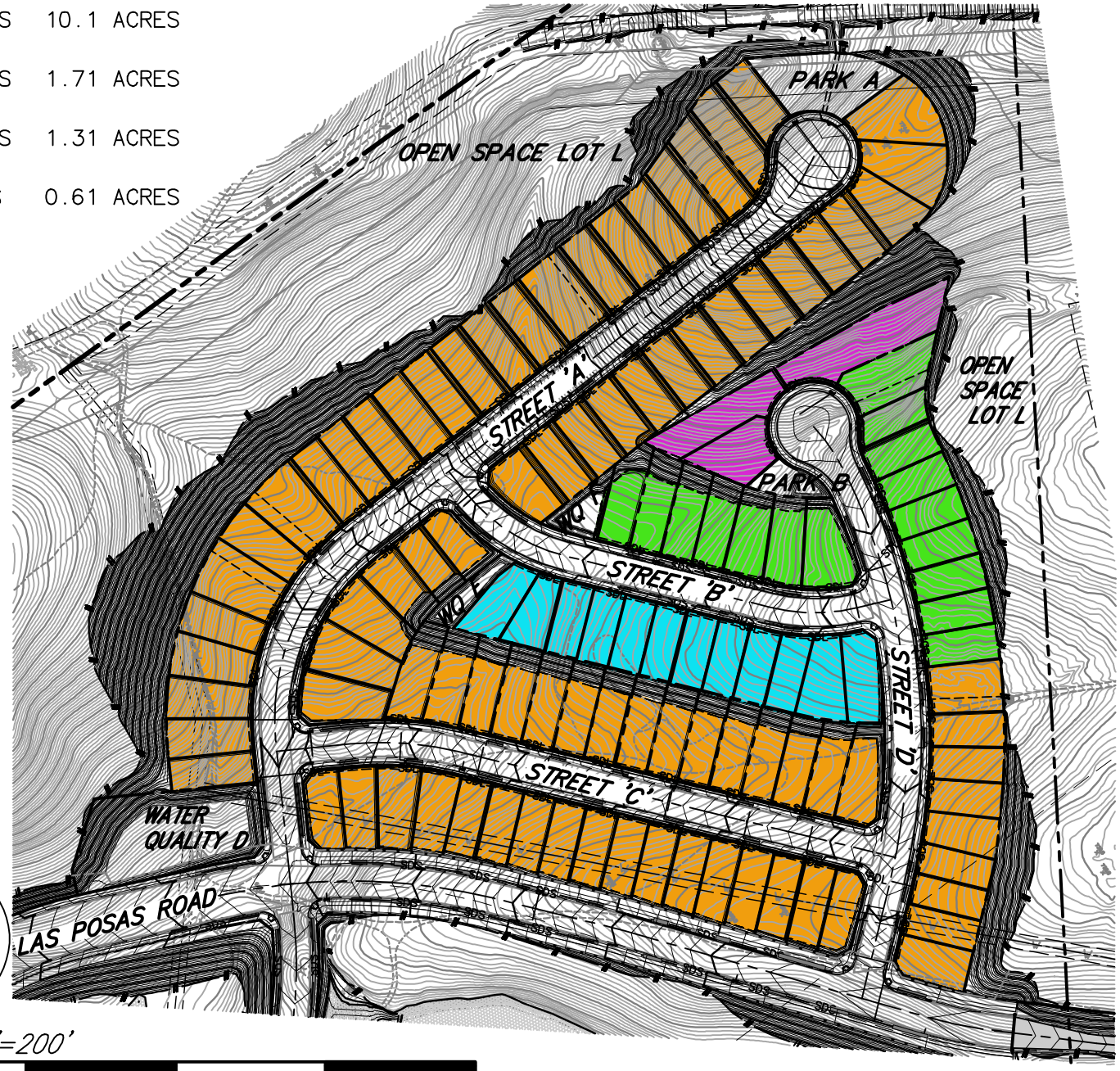
**SAN MARCOS HIGHLANDS**
**TYPICAL IMPERVIOUS SURFACE**
**LOT EXHIBIT**

SCALE 1"=20'

# WATER QUALITY BASINS EXHIBIT

## LEGEND

| | | |
|---|---|---|
| WATER QUALITY D | 86 LOTS | 10.1 ACRES |
| WATER QUALITY F | 16 LOTS | 1.71 ACRES |
| WATER QUALITY E | 12 LOTS | 1.31 ACRES |
| PARK B | 3 LOTS | 0.61 ACRES |




SCALE: 1"=200'

0 200 400 600 800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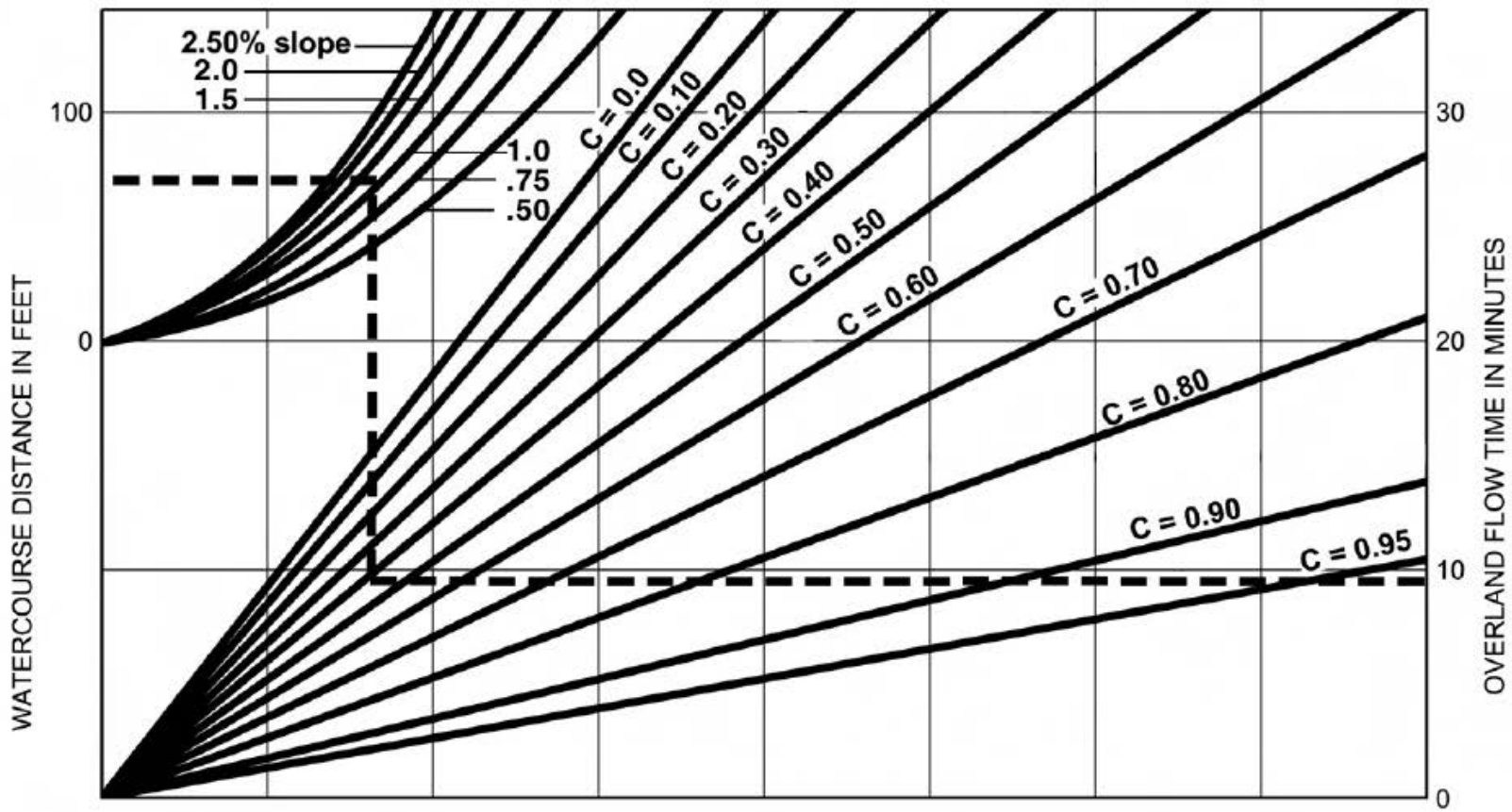
APPENDIX 2

CHARTS AND FIGURES FROM THE SAN DIEGO COUNTY HYDROLOGY MANUAL




EXAMPLE:

Given: Watercourse Distance (D) = 70 Feet
Slope (s) = 1.3%
Runoff Coefficient (C) = 0.41
Overland Flow Time (T) = 9.5 Minutes

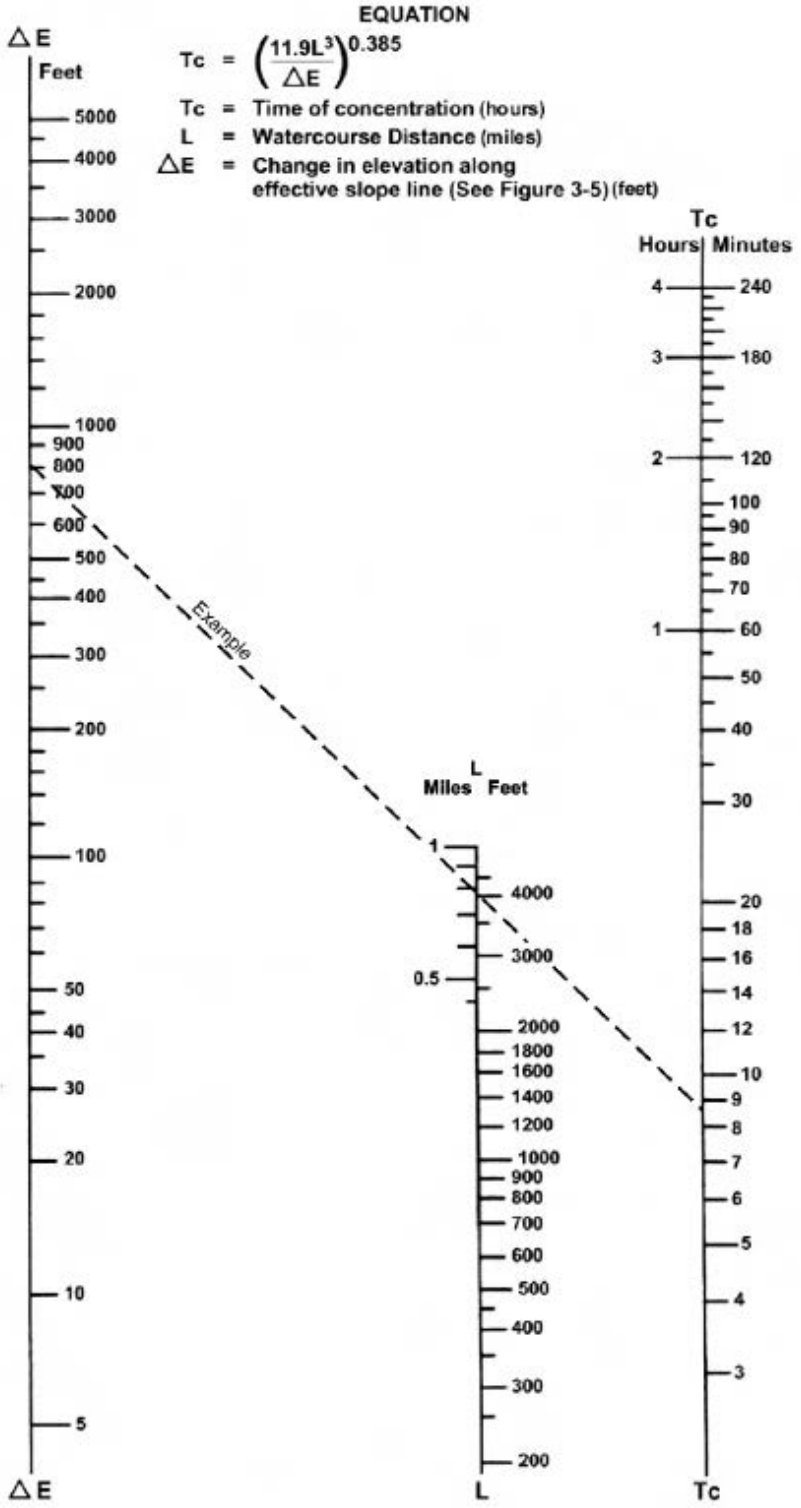
$$T = \frac{1.8\,(1.1-C)\sqrt{D}}{\sqrt[3]{s}}$$

SOURCE: Airport Drainage, Federal Aviation Administration, 1965

FIGURE

**Rational Formula - Overland Time of Flow Nomograph**

**3-3**

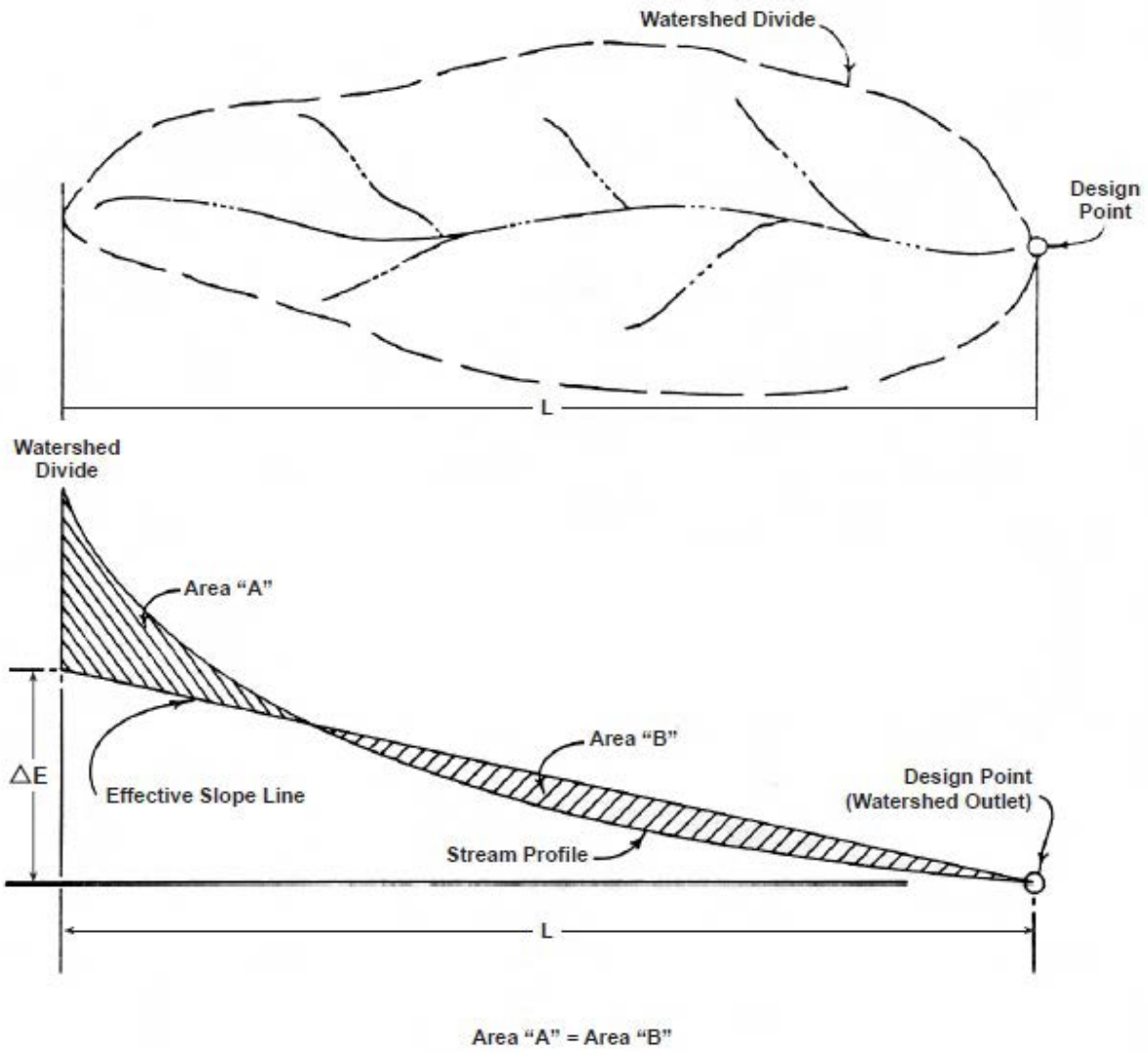



SOURCE: California Division of Highways (1941) and Kirpich (1940)

FIGURE

**3-4**

Nomograph for Determination of
Time of Concentration (Tc) or Travel Time (Tt) for Natural Watersheds

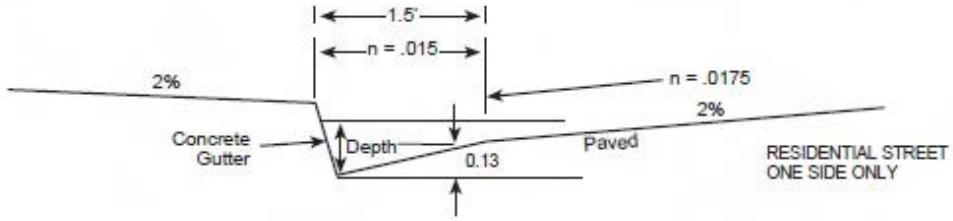


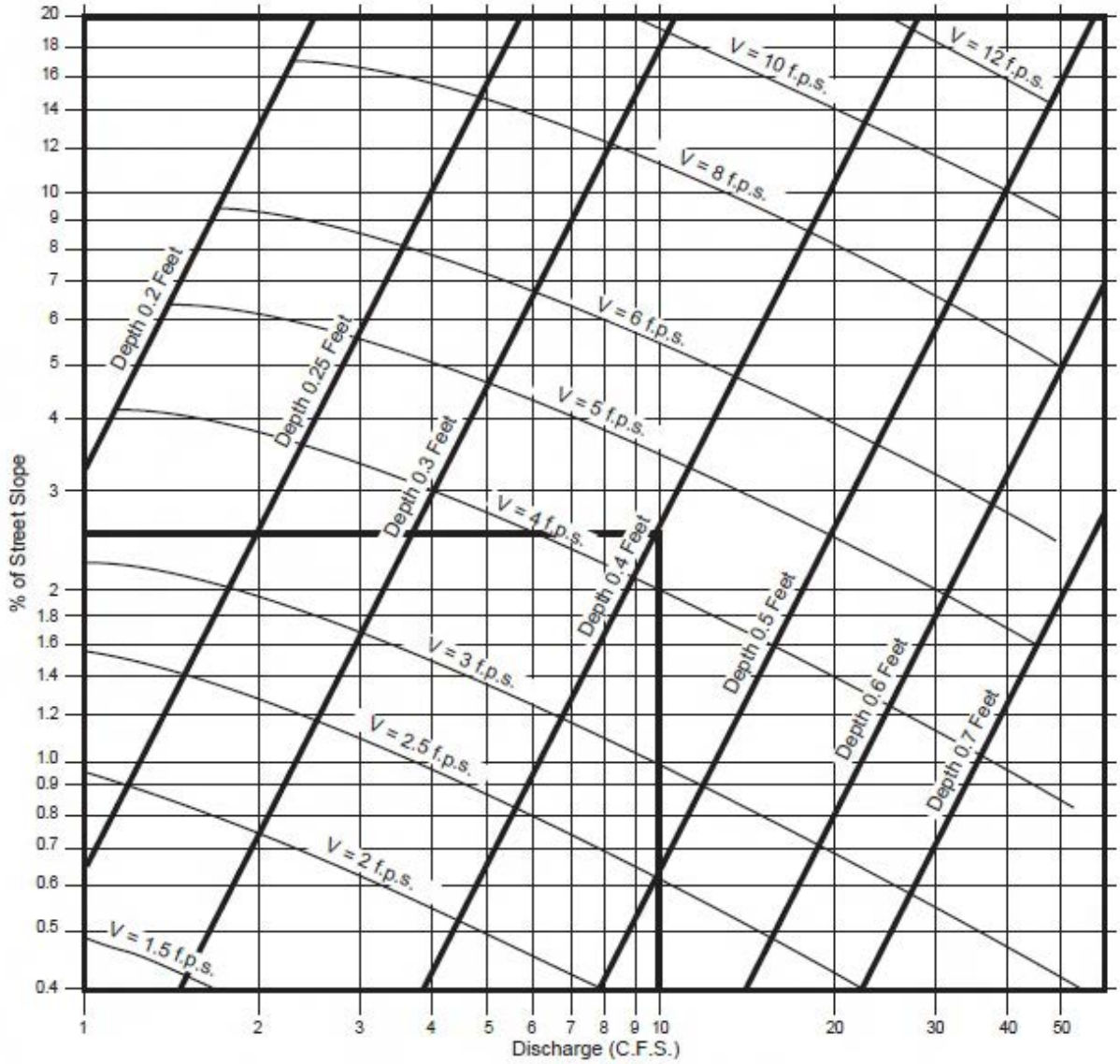

SOURCE: California Division of Highways (1941) and Kirpich (1940)

FIGURE

Computation of Effective Slope for Natural Watersheds

3-5




**EXAMPLE:**
**Given: Q = 10 S = 2.5%**
**Chart gives: Depth = 0.4, Velocity = 4.4 f.p.s.**

SOURCE: San Diego County Department of Special District Services Design Manual

FIGURE

**Gutter and Roadway Discharge - Velocity Chart**

**3-6**

**Table 3-1**
**RUNOFF COEFFICIENTS FOR URBAN AREAS**

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

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

Note that the Initial Time of Concentration should be reflective of the general land-use at the upstream end of a drainage basin. A single lot with an area of two or less acres does not have a significant effect where the drainage basin area is 20 to 600 acres.

Table 3-2 provides limits of the length (Maximum Length ($L_M$)) of sheet flow to be used in hydrology studies. Initial $T_i$ values based on average C values for the Land Use Element are also included. These values can be used in planning and design applications as described below. Exceptions may be approved by the "Regulating Agency" when submitted with a detailed study.

**Table 3-2**

**MAXIMUM OVERLAND FLOW LENGTH ($L_M$) & INITIAL TIME OF CONCENTRATION ($T_i$)**

| Element* | DU/ | .5% | | 1% | | 2% | | 3% | | 5% | | 10% | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Acre | $L_M$ | $T_i$ | $L_M$ | $T_i$ | $L_M$ | $T_i$ | $L_M$ | $T_i$ | $L_M$ | $T_i$ | $L_M$ | $T_i$ |
| Natural | | 50 | 13.2 | 70 | 12.5 | 85 | 10.9 | 100 | 10.3 | 100 | 8.7 | 100 | 6.9 |
| LDR | 1 | 50 | 12.2 | 70 | 11.5 | 85 | 10.0 | 100 | 9.5 | 100 | 8.0 | 100 | 6.4 |
| LDR | 2 | 50 | 11.3 | 70 | 10.5 | 85 | 9.2 | 100 | 8.8 | 100 | 7.4 | 100 | 5.8 |
| LDR | 2.9 | 50 | 10.7 | 70 | 10.0 | 85 | 8.8 | 95 | 8.1 | 100 | 7.0 | 100 | 5.6 |
| MDR | 4.3 | 50 | 10.2 | 70 | 9.6 | 80 | 8.1 | 95 | 7.8 | 100 | 6.7 | 100 | 5.3 |
| MDR | 7.3 | 50 | 9.2 | 65 | 8.4 | 80 | 7.4 | 95 | 7.0 | 100 | 6.0 | 100 | 4.8 |
| MDR | 10.9 | 50 | 8.7 | 65 | 7.9 | 80 | 6.9 | 90 | 6.4 | 100 | 5.7 | 100 | 4.5 |
| MDR | 14.5 | 50 | 8.2 | 65 | 7.4 | 80 | 6.5 | 90 | 6.0 | 100 | 5.4 | 100 | 4.3 |
| HDR | 24 | 50 | 6.7 | 65 | 6.1 | 75 | 5.1 | 90 | 4.9 | 95 | 4.3 | 100 | 3.5 |
| HDR | 43 | 50 | 5.3 | 65 | 4.7 | 75 | 4.0 | 85 | 3.8 | 95 | 3.4 | 100 | 2.7 |
| N. Com | | 50 | 5.3 | 60 | 4.5 | 75 | 4.0 | 85 | 3.8 | 95 | 3.4 | 100 | 2.7 |
| G. Com | | 50 | 4.7 | 60 | 4.1 | 75 | 3.6 | 85 | 3.4 | 90 | 2.9 | 100 | 2.4 |
| O.P./Com | | 50 | 4.2 | 60 | 3.7 | 70 | 3.1 | 80 | 2.9 | 90 | 2.6 | 100 | 2.2 |
| Limited I. | | 50 | 4.2 | 60 | 3.7 | 70 | 3.1 | 80 | 2.9 | 90 | 2.6 | 100 | 2.2 |
| General I. | | 50 | 3.7 | 60 | 3.2 | 70 | 2.7 | 80 | 2.6 | 90 | 2.3 | 100 | 1.9 |

*See Table 3-1 for more detailed description

APPENDIX 3

PRE-DEVELOPMENT HYDROLOGY CALCULATION

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2004 Version 7.4

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
        Rational Hydrology Study        Date: 12/04/12
----------------------------------------------------------------------
FINAL OUTFALL 10 - Las Posas Road: Node 1 TO 6
PRE DEVELOPMENT
100 Year Storm Event
File Name: 12052PRE.RD3

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

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


Program License Serial Number 4012

----------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                     ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Initial subarea total flow distance  = 1012.000(Ft.)
Highest elevation = 1140.000(Ft.)
Lowest elevation =  900.000(Ft.)
Elevation difference =  240.000(Ft.) Slope = 23.715 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  23.72 %, in a development type of
 1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.32 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4100)*( 100.000^.5)/(  23.715^(1/3)]=   4.32
The initial area total distance of 1012.00 (Ft.) entered leaves a
remaining distance of  912.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   2.58 minutes
for a distance of 912.00 (Ft.) and a slope of 23.72 %
with an elevation difference of 216.28(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    2.585 Minutes
Tt=[(11.9*0.1727^3)/(216.28)]^.385=  2.58
Total initial area Ti =   4.32 minutes from Figure 3-3 formula plus
  2.58 minutes from the Figure 3-4 formula =   6.91 minutes
Rainfall intensity (I) =      7.486(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
Subarea runoff =     45.998(CFS)
Total initial stream area =       14.986(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =    148.425(CFS)
Depth of flow =   1.083(Ft.), Average velocity =  12.664(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00             10.00
       2            100.00              0.00
       3            200.00             10.00
Manning's 'N' friction factor =   0.020
----------------------------------------------------------------
Sub-Channel flow  =    148.425(CFS)
  '     '       flow top width =     21.652(Ft.)
  '     '    velocity=   12.664(Ft/s)
  '     '       area =     11.720(Sq.Ft)
  '     '       Froude number =     3.033

Upstream point elevation =   900.000(Ft.)
Downstream point elevation =   721.000(Ft.)
Flow length =  2700.000(Ft.)
Travel time  =    3.55 min.
Time of concentration =   10.46 min.
Depth of flow =   1.083(Ft.)
Average velocity =  12.664(Ft/s)
Total irregular channel flow =   148.425(CFS)
Irregular channel normal depth above invert elev. =   1.083(Ft.)
Average velocity of channel(s) =  12.664(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Rainfall intensity =      5.728(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.410  CA =     43.782
Subarea runoff =    204.795(CFS) for     91.800(Ac.)
Total runoff =    250.793(CFS)        Total area =     106.786(Ac.)
Depth of flow =   1.318(Ft.), Average velocity =  14.439(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        4.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =    306.499(CFS)
Depth of flow =   1.720(Ft.), Average velocity =  10.365(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              5.00
       2            100.00              0.00
       3            100.00              5.00
Manning's 'N' friction factor =   0.023
----------------------------------------------------------------
Sub-Channel flow  =    306.500(CFS)
  '     '       flow top width =     34.392(Ft.)
  '     '    velocity=   10.365(Ft/s)
  '     '       area =     29.570(Sq.Ft)
  '     '       Froude number =     1.970
```

```
Upstream point elevation =   721.000(Ft.)
Downstream point elevation =   668.000(Ft.)
Flow length =  1575.000(Ft.)
Travel time  =    2.53 min.
Time of concentration =   12.99 min.
Depth of flow =   1.720(Ft.)
Average velocity =  10.365(Ft/s)
Total irregular channel flow =   306.499(CFS)
Irregular channel normal depth above invert elev. =   1.720(Ft.)
Average velocity of channel(s) =  10.365(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Rainfall intensity =      4.981(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.410  CA =     72.709
Subarea runoff =    111.349(CFS) for     70.554(Ac.)
Total runoff =    362.143(CFS)        Total area =     177.340(Ac.)
Depth of flow =   1.831(Ft.), Average velocity =  10.807(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        4.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    177.340(Ac.)
Runoff from this stream =    362.143(CFS)
Time of concentration =   12.99 min.
Rainfall intensity =     4.981(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station       10.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Initial subarea total flow distance  = 1909.000(Ft.)
Highest elevation = 1302.000(Ft.)
Lowest elevation =  820.000(Ft.)
Elevation difference =  482.000(Ft.) Slope = 25.249 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  25.25 %, in a development type of
 1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.23 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4100)*( 100.000^.5)/(  25.249^(1/3)]=   4.23
The initial area total distance of 1909.00 (Ft.) entered leaves a
remaining distance of 1809.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   4.28 minutes
for a distance of 1809.00 (Ft.) and a slope of 25.25 %
with an elevation difference of 456.75(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    4.275 Minutes
Tt=[(11.9*0.3426^3)/(456.75)]^.385=  4.28
Total initial area Ti =   4.23 minutes from Figure 3-3 formula plus
```

```
  4.28 minutes from the Figure 3-4 formula =   8.51 minutes
Rainfall intensity (I) =      6.544(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
Subarea runoff =     60.081(CFS)
Total initial stream area =       22.391(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station        4.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =    197.122(CFS)
Depth of flow =   0.923(Ft.), Average velocity =  11.577(Ft/s)
       ******* Irregular Channel Data ***********
--------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              5.00
       2            100.00              0.00
       3            200.00              5.00
Manning's 'N' friction factor =   0.020
--------------------------------------------------------------
Sub-Channel flow  =    197.122(CFS)
  '     '       flow top width =     36.907(Ft.)
  '     '    velocity=   11.577(Ft/s)
  '     '       area =     17.027(Sq.Ft)
  '     '       Froude number =     3.004

Upstream point elevation =   820.000(Ft.)
Downstream point elevation =   668.000(Ft.)
Flow length =  2228.000(Ft.)
Travel time  =    3.21 min.
Time of concentration =   11.72 min.
Depth of flow =   0.923(Ft.)
Average velocity =  11.577(Ft/s)
Total irregular channel flow =   197.122(CFS)
Irregular channel normal depth above invert elev. =   0.923(Ft.)
Average velocity of channel(s) =  11.577(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                      ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Rainfall intensity =      5.324(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.410  CA =     62.750
Subarea runoff =    274.030(CFS) for    130.659(Ac.)
Total runoff =    334.110(CFS)        Total area =     153.050(Ac.)
Depth of flow =   1.125(Ft.), Average velocity =  13.210(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        4.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =    153.050(Ac.)
Runoff from this stream =    334.110(CFS)
Time of concentration =   11.72 min.
Rainfall intensity =     5.324(In/Hr)
Summary of stream data:

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


1      362.143     12.99               4.981
```

```
2      334.110     11.72               5.324
Qmax(1) =
          1.000 *    1.000 *   362.143) +
          0.935 *    1.000 *   334.110) + =     674.683
Qmax(2) =
          1.000 *    0.902 *   362.143) +
          1.000 *    1.000 *   334.110) + =     660.656

Total of 2 streams to confluence:
Flow rates before confluence point:
     362.143     334.110
Maximum flow rates at confluence using above data:
      674.683      660.656
Area of streams before confluence:
      177.340      153.050
Results of confluence:
Total flow rate =    674.683(CFS)
Time of concentration =    12.993 min.
Effective stream area after confluence =    330.390(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        5.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =    674.727(CFS)
Depth of flow =   0.567(Ft.), Average velocity =   8.040(Ft/s)
       ******* Irregular Channel Data ***********
--------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00             24.00
       2             89.00              0.00
       3            235.00              0.00
       4            343.00             30.00
Manning's 'N' friction factor =   0.020
--------------------------------------------------------------
Sub-Channel flow  =    674.728(CFS)
  '     '       flow top width =    150.142(Ft.)
  '     '    velocity=    8.040(Ft/s)
  '     '       area =     83.923(Sq.Ft)
  '     '       Froude number =     1.895

Upstream point elevation =   668.000(Ft.)
Downstream point elevation =   631.000(Ft.)
Flow length =  1453.000(Ft.)
Travel time  =    3.01 min.
Time of concentration =   16.01 min.
Depth of flow =   0.567(Ft.)
Average velocity =   8.040(Ft/s)
Total irregular channel flow =   674.727(CFS)
Irregular channel normal depth above invert elev. =   0.567(Ft.)
Average velocity of channel(s) =   8.040(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
The area added to the existing stream causes a
a lower flow rate of Q =    623.034(CFS)
therefore the upstream flow rate of Q =    674.683(CFS) is being used
Rainfall intensity =      4.354(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.406  CA =    143.095
Subarea runoff =      0.000(CFS) for     21.815(Ac.)
Total runoff =    674.683(CFS)        Total area =     352.205(Ac.)
Depth of flow =   0.567(Ft.), Average velocity =   8.040(Ft/s)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        5.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    352.205(Ac.)
Runoff from this stream =    674.683(CFS)
Time of concentration =   16.01 min.
Rainfall intensity =     4.354(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        8.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                      ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Initial subarea total flow distance  =  756.000(Ft.)
Highest elevation =  905.000(Ft.)
Lowest elevation =  780.000(Ft.)
Elevation difference =  125.000(Ft.) Slope = 16.534 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  16.53 %, in a development type of
 1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.88 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4100)*( 100.000^.5)/(  16.534^(1/3)]=   4.88
The initial area total distance of  756.00 (Ft.) entered leaves a
remaining distance of  656.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   2.30 minutes
for a distance of 656.00 (Ft.) and a slope of 16.53 %
with an elevation difference of 108.46(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    2.304 Minutes
Tt=[(11.9*0.1242^3)/(108.46)]^.385=  2.30
Total initial area Ti =   4.88 minutes from Figure 3-3 formula plus
  2.30 minutes from the Figure 3-4 formula =   7.18 minutes
Rainfall intensity (I) =      7.302(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
Subarea runoff =     67.627(CFS)
Total initial stream area =       22.588(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        8.000 to Point/Station        5.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =    167.694(CFS)
Depth of flow =   2.182(Ft.), Average velocity =  17.616(Ft/s)
        ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00             10.00
        2             20.00              0.00
        3             40.00             10.00
Manning's 'N' friction factor =   0.020
----------------------------------------------------------------
Sub-Channel flow  =    167.694(CFS)
  '     '       flow top width =      8.727(Ft.)
  '     '    velocity=   17.616(Ft/s)
```

```
  '     '       area =      9.519(Sq.Ft)
  '     '       Froude number =     2.972

Upstream point elevation =   780.000(Ft.)
Downstream point elevation =   631.000(Ft.)
Flow length =  2565.000(Ft.)
Travel time  =    2.43 min.
Time of concentration =    9.61 min.
Depth of flow =   2.182(Ft.)
Average velocity =  17.616(Ft/s)
Total irregular channel flow =   167.694(CFS)
Irregular channel normal depth above invert elev. =   2.182(Ft.)
Average velocity of channel(s) =  17.616(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Rainfall intensity =      6.052(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.410  CA =     44.232
Subarea runoff =    200.061(CFS) for     85.295(Ac.)
Total runoff =    267.688(CFS)        Total area =     107.883(Ac.)
Depth of flow =   2.600(Ft.), Average velocity =  19.801(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        5.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =    107.883(Ac.)
Runoff from this stream =    267.688(CFS)
Time of concentration =    9.61 min.
Rainfall intensity =     6.052(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station        5.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  = 2318.000(Ft.)
Highest elevation = 1025.000(Ft.)
Lowest elevation =  631.000(Ft.)
Elevation difference =  394.000(Ft.) Slope = 16.997 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  17.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.25 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(  16.997^(1/3)]=   5.25
The initial area total distance of 2318.00 (Ft.) entered leaves a
remaining distance of 2218.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   5.82 minutes
for a distance of 2218.00 (Ft.) and a slope of 17.00 %
with an elevation difference of 376.99(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
```

```
 =    5.825 Minutes
Tt=[(11.9*0.4201^3)/(376.99)]^.385=  5.82
Total initial area Ti =   5.25 minutes from Figure 3-3 formula plus
  5.82 minutes from the Figure 3-4 formula =  11.08 minutes
Rainfall intensity (I) =      5.521(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =     43.714(CFS)
Total initial stream area =       22.622(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        5.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =     22.622(Ac.)
Runoff from this stream =     43.714(CFS)
Time of concentration =   11.08 min.
Rainfall intensity =     5.521(In/Hr)
Summary of stream data:

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


1      674.683     16.01               4.354
2      267.688      9.61               6.052
3       43.714     11.08               5.521
Qmax(1) =
          1.000 *    1.000 *   674.683) +
          0.719 *    1.000 *   267.688) +
          0.789 *    1.000 *    43.714) + =     901.743
Qmax(2) =
          1.000 *    0.600 *   674.683) +
          1.000 *    1.000 *   267.688) +
          1.000 *    0.867 *    43.714) + =     710.539
Qmax(3) =
          1.000 *    0.692 *   674.683) +
          0.912 *    1.000 *   267.688) +
          1.000 *    1.000 *    43.714) + =     754.794

Total of 3 streams to confluence:
Flow rates before confluence point:
     674.683     267.688      43.714
Maximum flow rates at confluence using above data:
      901.743      710.539      754.794
Area of streams before confluence:
      352.205      107.883       22.622
Results of confluence:
Total flow rate =    901.743(CFS)
Time of concentration =    16.006 min.
Effective stream area after confluence =    482.710(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        6.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =    912.970(CFS)
Depth of flow =   2.797(Ft.), Average velocity =  11.670(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00             10.00
        2            100.00              0.00
        3            200.00             10.00
Manning's 'N' friction factor =   0.025
-----------------------------------------------------------------
Sub-Channel flow  =    912.971(CFS)
  '     '       flow top width =     55.940(Ft.)
```

```
  '     '    velocity=   11.670(Ft/s)
  '     '       area =     78.232(Sq.Ft)
  '     '       Froude number =     1.739

Upstream point elevation =   631.000(Ft.)
Downstream point elevation =   575.000(Ft.)
Flow length =  2257.000(Ft.)
Travel time  =    3.22 min.
Time of concentration =   19.23 min.
Depth of flow =   2.797(Ft.)
Average velocity =  11.670(Ft/s)
Total irregular channel flow =   912.970(CFS)
Irregular channel normal depth above invert elev. =   2.797(Ft.)
Average velocity of channel(s) =  11.670(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                     ]
(2.0 DU/A or Less       )
Impervious value, Ai = 0.200
Sub-Area C Value = 0.460
Rainfall intensity =      3.868(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.414  CA =    238.909
Subarea runoff =     22.369(CFS) for     94.923(Ac.)
Total runoff =    924.112(CFS)        Total area =     577.633(Ac.)
Depth of flow =   2.810(Ft.), Average velocity =  11.706(Ft/s)
End of computations, total study area =         577.633 (Ac.)
```

APPENDIX 4

POST-DEVELOPMENT HYDROLOGY CALCULATION

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2004 Version 7.4

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
       Rational Hydrology Study        Date: 02/15/13
----------------------------------------------------------------------
OUTFALL 1 - Las Posas Road: Node 500-511
POST DEVELOPMENT BEFORE DETENTION
100 Year Storm Event
File Name: 12052OUTFALL1
----------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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


Program License Serial Number 4012

----------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      500.000 to Point/Station      501.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  156.000(Ft.)
Highest elevation =  694.400(Ft.)
Lowest elevation =  693.000(Ft.)
Elevation difference =    1.400(Ft.) Slope =  0.897 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 65.00 (Ft)
for the top area slope value of   0.90 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.52 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  65.000^.5)/(   0.897^(1/3)]=   7.52
Rainfall intensity (I) =      7.085(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.650(CFS)
Total initial stream area =        0.153(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      501.000 to Point/Station      502.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   688.500(Ft.)
Downstream point/station elevation =   687.000(Ft.)
Pipe length  =   166.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.650(CFS)
Nearest computed pipe diameter  =      9.00(In.)
```

```
Calculated individual pipe flow  =     0.650(CFS)
Normal flow depth in pipe =    4.03(In.)
Flow top width inside pipe =    8.95(In.)
Critical Depth =    4.39(In.)
Pipe flow velocity =      3.39(Ft/s)
Travel time through pipe =    0.82 min.
Time of concentration (TC) =     8.34 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      502.000 to Point/Station      502.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.34 min.
Rainfall intensity =      6.630(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.223
Subarea runoff =      0.829(CFS) for      0.219(Ac.)
Total runoff =      1.480(CFS)        Total area =       0.372(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      502.000 to Point/Station      503.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   687.000(Ft.)
Downstream point/station elevation =   685.000(Ft.)
Pipe length  =    87.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.480(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.480(CFS)
Normal flow depth in pipe =    4.97(In.)
Flow top width inside pipe =    8.95(In.)
Critical Depth =    6.72(In.)
Pipe flow velocity =      5.91(Ft/s)
Travel time through pipe =    0.25 min.
Time of concentration (TC) =     8.59 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      503.000 to Point/Station      503.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.59 min.
Rainfall intensity =      6.507(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.281
Subarea runoff =      0.351(CFS) for      0.097(Ac.)
Total runoff =      1.831(CFS)        Total area =       0.469(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      503.000 to Point/Station      504.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
```

```
Upstream point/station elevation =   685.000(Ft.)
Downstream point/station elevation =   682.100(Ft.)
Pipe length  =    69.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.831(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.831(CFS)
Normal flow depth in pipe =    4.71(In.)
Flow top width inside pipe =    8.99(In.)
Critical Depth =    7.43(In.)
Pipe flow velocity =      7.82(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =     8.73 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      504.000 to Point/Station      510.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   682.100(Ft.)
Downstream point/station elevation =   681.300(Ft.)
Pipe length  =    44.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.831(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.831(CFS)
Normal flow depth in pipe =    6.21(In.)
Flow top width inside pipe =    8.32(In.)
Critical Depth =    7.43(In.)
Pipe flow velocity =      5.64(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =     8.86 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      510.000 to Point/Station      510.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.469(Ac.)
Runoff from this stream =      1.831(CFS)
Time of concentration =    8.86 min.
Rainfall intensity =     6.375(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      505.000 to Point/Station      506.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  156.000(Ft.)
Highest elevation =  694.400(Ft.)
Lowest elevation =  693.100(Ft.)
Elevation difference =    1.300(Ft.) Slope =  0.833 %
Top of Initial Area Slope adjusted by User to  1.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 65.00 (Ft)
for the top area slope value of   1.00 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.26 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  65.000^.5)/(   1.000^(1/3)]=   7.26
Rainfall intensity (I) =      7.253(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.635(CFS)
```

```
Total initial stream area =        0.146(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      506.000 to Point/Station      507.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   688.600(Ft.)
Downstream point/station elevation =   687.900(Ft.)
Pipe length  =    83.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.635(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.635(CFS)
Normal flow depth in pipe =    4.06(In.)
Flow top width inside pipe =    8.96(In.)
Critical Depth =    4.34(In.)
Pipe flow velocity =      3.29(Ft/s)
Travel time through pipe =    0.42 min.
Time of concentration (TC) =     7.68 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      507.000 to Point/Station      507.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     7.68 min.
Rainfall intensity =      6.993(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.139
Subarea runoff =      0.338(CFS) for      0.086(Ac.)
Total runoff =      0.973(CFS)        Total area =       0.232(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      507.000 to Point/Station      508.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   687.900(Ft.)
Downstream point/station elevation =   686.900(Ft.)
Pipe length  =    85.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.973(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.973(CFS)
Normal flow depth in pipe =    4.72(In.)
Flow top width inside pipe =    8.99(In.)
Critical Depth =    5.43(In.)
Pipe flow velocity =      4.14(Ft/s)
Travel time through pipe =    0.34 min.
Time of concentration (TC) =     8.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      508.000 to Point/Station      508.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
```

```
Time of concentration =     8.02 min.
Rainfall intensity =      6.800(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.189
Subarea runoff =      0.312(CFS) for      0.083(Ac.)
Total runoff =      1.285(CFS)        Total area =       0.315(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      508.000 to Point/Station      509.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   686.900(Ft.)
Downstream point/station elevation =   684.900(Ft.)
Pipe length  =    85.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.285(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.285(CFS)
Normal flow depth in pipe =    4.54(In.)
Flow top width inside pipe =    9.00(In.)
Critical Depth =    6.26(In.)
Pipe flow velocity =      5.76(Ft/s)
Travel time through pipe =    0.25 min.
Time of concentration (TC) =     8.26 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      509.000 to Point/Station      509.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.26 min.
Rainfall intensity =      6.669(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.240
Subarea runoff =      0.315(CFS) for      0.085(Ac.)
Total runoff =      1.600(CFS)        Total area =       0.400(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      509.000 to Point/Station      510.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   684.900(Ft.)
Downstream point/station elevation =   681.300(Ft.)
Pipe length  =    85.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.600(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.600(CFS)
Normal flow depth in pipe =    4.34(In.)
Flow top width inside pipe =    8.99(In.)
Critical Depth =    6.98(In.)
Pipe flow velocity =      7.59(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =     8.45 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      510.000 to Point/Station      510.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
```

```
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.45 min.
Rainfall intensity =      6.573(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.285
Subarea runoff =      0.273(CFS) for      0.075(Ac.)
Total runoff =      1.873(CFS)        Total area =       0.475(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      510.000 to Point/Station      510.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.475(Ac.)
Runoff from this stream =      1.873(CFS)
Time of concentration =    8.45 min.
Rainfall intensity =     6.573(In/Hr)
Summary of stream data:

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


1        1.831      8.86               6.375
2        1.873      8.45               6.573
Qmax(1) =
          1.000 *    1.000 *     1.831) +
          0.970 *    1.000 *     1.873) + =       3.648
Qmax(2) =
          1.000 *    0.954 *     1.831) +
          1.000 *    1.000 *     1.873) + =       3.619

Total of 2 streams to confluence:
Flow rates before confluence point:
       1.831       1.873
Maximum flow rates at confluence using above data:
        3.648        3.619
Area of streams before confluence:
        0.469        0.475
Results of confluence:
Total flow rate =      3.648(CFS)
Time of concentration =     8.862 min.
Effective stream area after confluence =      0.944(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      510.000 to Point/Station      511.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   681.300(Ft.)
Downstream point/station elevation =   680.500(Ft.)
Pipe length  =    23.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.648(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     3.648(CFS)
Normal flow depth in pipe =    6.35(In.)
Flow top width inside pipe =   11.98(In.)
Critical Depth =    9.78(In.)
Pipe flow velocity =      8.66(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =     8.91 min.
End of computations, total study area =           0.944 (Ac.)
```

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2004 Version 7.4

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
        Rational Hydrology Study        Date: 02/15/13
------------------------------------------------------------------------
OUTFALL 2 - Las Posas Road: Node 504-523
POST DEVELOPMENT BEFORE DETENTION
100 Year Storm Event
File Name: 12052OUTFALL2
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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


Program License Serial Number 4012

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      504.000 to Point/Station      512.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   98.000(Ft.)
Highest elevation =  682.100(Ft.)
Lowest elevation =  678.500(Ft.)
Elevation difference =    3.600(Ft.) Slope =  3.673 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   3.67 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.53 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  90.000^.5)/(   3.673^(1/3)]=   5.53
Rainfall intensity (I) =      8.638(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.565(CFS)
Total initial stream area =        0.109(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      512.000 to Point/Station      513.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   678.500(Ft.)
Downstream point/station elevation =   675.200(Ft.)
Pipe length  =    90.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.565(CFS)
Nearest computed pipe diameter  =      6.00(In.)
```

```
Calculated individual pipe flow  =     0.565(CFS)
Normal flow depth in pipe =    3.09(In.)
Flow top width inside pipe =    6.00(In.)
Critical Depth =    4.59(In.)
Pipe flow velocity =      5.54(Ft/s)
Travel time through pipe =    0.27 min.
Time of concentration (TC) =     5.80 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      513.000 to Point/Station      513.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     5.80 min.
Rainfall intensity =      8.376(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.125
Subarea runoff =      0.480(CFS) for      0.099(Ac.)
Total runoff =      1.045(CFS)       Total area =       0.208(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      513.000 to Point/Station      514.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   675.200(Ft.)
Downstream point/station elevation =   672.100(Ft.)
Pipe length  =    86.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.045(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.045(CFS)
Normal flow depth in pipe =    4.82(In.)
Flow top width inside pipe =    4.78(In.)
Critical depth could not be calculated.
Pipe flow velocity =      6.18(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =     6.04 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      514.000 to Point/Station      514.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.04 min.
Rainfall intensity =      8.167(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.184
Subarea runoff =      0.459(CFS) for      0.099(Ac.)
Total runoff =      1.504(CFS)       Total area =       0.307(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      514.000 to Point/Station      515.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
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Upstream point/station elevation =   672.100(Ft.)
Downstream point/station elevation =   668.800(Ft.)
Pipe length  =    92.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.504(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.504(CFS)
Normal flow depth in pipe =    4.39(In.)
Flow top width inside pipe =    9.00(In.)
Critical Depth =    6.78(In.)
Pipe flow velocity =      7.02(Ft/s)
Travel time through pipe =    0.22 min.
Time of concentration (TC) =     6.25 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      515.000 to Point/Station      515.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.25 min.
Rainfall intensity =      7.982(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.243
Subarea runoff =      0.435(CFS) for      0.098(Ac.)
Total runoff =      1.940(CFS)        Total area =       0.405(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      515.000 to Point/Station      516.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   668.800(Ft.)
Downstream point/station elevation =   667.000(Ft.)
Pipe length  =    55.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.940(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.940(CFS)
Normal flow depth in pipe =    5.27(In.)
Flow top width inside pipe =    8.87(In.)
Critical Depth =    7.61(In.)
Pipe flow velocity =      7.21(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =     6.38 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      516.000 to Point/Station      516.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.38 min.
Rainfall intensity =      7.879(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.279
Subarea runoff =      0.259(CFS) for      0.060(Ac.)
Total runoff =      2.198(CFS)        Total area =       0.465(Ac.)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      516.000 to Point/Station      521.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   667.000(Ft.)
Downstream point/station elevation =   666.000(Ft.)
Pipe length  =    45.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.198(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.198(CFS)
Normal flow depth in pipe =    6.62(In.)
Flow top width inside pipe =    7.94(In.)
Critical Depth =    7.98(In.)
Pipe flow velocity =      6.31(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =     6.50 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      521.000 to Point/Station      521.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.465(Ac.)
Runoff from this stream =      2.198(CFS)
Time of concentration =    6.50 min.
Rainfall intensity =     7.785(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      510.000 to Point/Station      517.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   96.000(Ft.)
Highest elevation =  686.800(Ft.)
Lowest elevation =  683.000(Ft.)
Elevation difference =    3.800(Ft.) Slope =  3.958 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   3.96 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.40 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  90.000^.5)/(   3.958^(1/3)]=   5.40
Rainfall intensity (I) =      8.777(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.495(CFS)
Total initial stream area =        0.094(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      517.000 to Point/Station      518.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   678.500(Ft.)
Downstream point/station elevation =   675.200(Ft.)
Pipe length  =    87.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.495(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.495(CFS)
Normal flow depth in pipe =    2.83(In.)
```

```
Flow top width inside pipe =    5.99(In.)
Critical Depth =    4.31(In.)
Pipe flow velocity =      5.43(Ft/s)
Travel time through pipe =    0.27 min.
Time of concentration (TC) =     5.66 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      518.000 to Point/Station      518.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     5.66 min.
Rainfall intensity =      8.508(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.108
Subarea runoff =      0.424(CFS) for      0.086(Ac.)
Total runoff =      0.919(CFS)        Total area =       0.180(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      518.000 to Point/Station      519.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   675.200(Ft.)
Downstream point/station elevation =   672.000(Ft.)
Pipe length  =    83.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.919(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.919(CFS)
Normal flow depth in pipe =    4.19(In.)
Flow top width inside pipe =    5.51(In.)
Critical Depth =    5.56(In.)
Pipe flow velocity =      6.28(Ft/s)
Travel time through pipe =    0.22 min.
Time of concentration (TC) =     5.88 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      519.000 to Point/Station      519.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     5.88 min.
Rainfall intensity =      8.301(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.157
Subarea runoff =      0.381(CFS) for      0.081(Ac.)
Total runoff =      1.300(CFS)        Total area =       0.261(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      519.000 to Point/Station      520.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   672.000(Ft.)
Downstream point/station elevation =   669.000(Ft.)
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```
Pipe length  =    84.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.300(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.300(CFS)
Normal flow depth in pipe =    4.05(In.)
Flow top width inside pipe =    8.95(In.)
Critical Depth =    6.31(In.)
Pipe flow velocity =      6.75(Ft/s)
Travel time through pipe =    0.21 min.
Time of concentration (TC) =     6.09 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      520.000 to Point/Station      520.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.09 min.
Rainfall intensity =      8.118(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.206
Subarea runoff =      0.371(CFS) for      0.082(Ac.)
Total runoff =      1.671(CFS)        Total area =       0.343(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      520.000 to Point/Station      521.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   669.000(Ft.)
Downstream point/station elevation =   666.000(Ft.)
Pipe length  =    57.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.671(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.671(CFS)
Normal flow depth in pipe =    4.18(In.)
Flow top width inside pipe =    8.98(In.)
Critical Depth =    7.12(In.)
Pipe flow velocity =      8.32(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =     6.21 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      521.000 to Point/Station      521.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.21 min.
Rainfall intensity =      8.021(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.238
Subarea runoff =      0.240(CFS) for      0.054(Ac.)
Total runoff =      1.911(CFS)        Total area =       0.397(Ac.)


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Process from Point/Station      521.000 to Point/Station      521.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.397(Ac.)
Runoff from this stream =      1.911(CFS)
Time of concentration =    6.21 min.
Rainfall intensity =     8.021(In/Hr)
Summary of stream data:

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


1        2.198      6.50               7.785
2        1.911      6.21               8.021
Qmax(1) =
          1.000 *    1.000 *     2.198) +
          0.971 *    1.000 *     1.911) + =       4.053
Qmax(2) =
          1.000 *    0.955 *     2.198) +
          1.000 *    1.000 *     1.911) + =       4.009

Total of 2 streams to confluence:
Flow rates before confluence point:
       2.198       1.911
Maximum flow rates at confluence using above data:
        4.053        4.009
Area of streams before confluence:
        0.465        0.397
Results of confluence:
Total flow rate =      4.053(CFS)
Time of concentration =     6.501 min.
Effective stream area after confluence =      0.862(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      521.000 to Point/Station      523.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________
Upstream point/station elevation =   666.000(Ft.)
Downstream point/station elevation =   665.000(Ft.)
Pipe length  =    25.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.053(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     4.053(CFS)
Normal flow depth in pipe =    6.48(In.)
Flow top width inside pipe =   11.96(In.)
Critical Depth =   10.23(In.)
Pipe flow velocity =      9.36(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =     6.55 min.
End of computations, total study area =          0.862 (Ac.)
```

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2004 Version 7.4

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
        Rational Hydrology Study        Date: 02/15/13
------------------------------------------------------------------------
OUTFALL 3 - Las Posas Road: Combination of Street A, B, C, D and WQ Pond E, F, and Park B
POST DEVELOPMENT BEFORE DETENTION
100 Year Storm Event
File Name: 12052OUTFALL3
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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


Program License Serial Number 4012

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   90.000(Ft.)
Highest elevation =  750.000(Ft.)
Lowest elevation =  745.000(Ft.)
Elevation difference =    5.000(Ft.) Slope =  5.556 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   5.56 %, in a development type of
 10.9 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =   5.70 minutes
 (for slope value of   5.00 %)
Rainfall intensity (I) =      8.474(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.336(CFS)
Total initial stream area =        0.066(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   737.000(Ft.)
Downstream point/station elevation =   732.000(Ft.)
Pipe length  =    54.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.336(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.336(CFS)
```

```
Normal flow depth in pipe =    1.80(In.)
Flow top width inside pipe =    5.50(In.)
Critical Depth =    3.52(In.)
Pipe flow velocity =      6.76(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =     5.83 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        3.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     5.83 min.
Rainfall intensity =      8.349(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.077
Subarea runoff =      0.306(CFS) for      0.062(Ac.)
Total runoff =      0.641(CFS)       Total area =       0.128(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        4.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   732.000(Ft.)
Downstream point/station elevation =   727.000(Ft.)
Pipe length  =    54.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.641(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.641(CFS)
Normal flow depth in pipe =    2.55(In.)
Flow top width inside pipe =    5.93(In.)
Critical Depth =    4.88(In.)
Pipe flow velocity =      8.08(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =     5.94 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        4.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     5.94 min.
Rainfall intensity =      8.248(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.115
Subarea runoff =      0.304(CFS) for      0.063(Ac.)
Total runoff =      0.945(CFS)       Total area =       0.191(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        5.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   727.000(Ft.)
```

```
Downstream point/station elevation =   717.000(Ft.)
Pipe length  =   100.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.945(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.945(CFS)
Normal flow depth in pipe =    3.11(In.)
Flow top width inside pipe =    6.00(In.)
Critical Depth =    5.60(In.)
Pipe flow velocity =      9.18(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =     6.13 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        5.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.13 min.
Rainfall intensity =      8.089(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.160
Subarea runoff =      0.351(CFS) for      0.076(Ac.)
Total runoff =      1.296(CFS)        Total area =       0.267(Ac.)


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Process from Point/Station        5.000 to Point/Station        6.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   717.000(Ft.)
Downstream point/station elevation =   710.000(Ft.)
Pipe length  =   110.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.296(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.296(CFS)
Normal flow depth in pipe =    4.51(In.)
Flow top width inside pipe =    5.18(In.)
Critical depth could not be calculated.
Pipe flow velocity =      8.17(Ft/s)
Travel time through pipe =    0.22 min.
Time of concentration (TC) =     6.35 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.000 to Point/Station        6.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.35 min.
Rainfall intensity =      7.904(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.205
Subarea runoff =      0.321(CFS) for      0.074(Ac.)
Total runoff =      1.617(CFS)        Total area =       0.341(Ac.)
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Process from Point/Station        6.000 to Point/Station        6.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.341(Ac.)
Runoff from this stream =      1.617(CFS)
Time of concentration =    6.35 min.
Rainfall intensity =     7.904(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.100 to Point/Station        6.100
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity (I) =      4.747(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  14.00 min.  Rain intensity =       4.75(In/Hr)
Total area =       30.120(Ac.)  Total runoff =    53.150(CFS)


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Process from Point/Station        6.100 to Point/Station        6.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   695.000(Ft.)
Downstream point/station elevation =   692.400(Ft.)
Pipe length  =   160.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    53.150(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    53.150(CFS)
Normal flow depth in pipe =   22.08(In.)
Flow top width inside pipe =   31.06(In.)
Critical Depth =   28.62(In.)
Pipe flow velocity =     12.57(Ft/s)
Travel time through pipe =    0.21 min.
Time of concentration (TC) =    14.21 min.


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Process from Point/Station        6.000 to Point/Station        6.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     30.120(Ac.)
Runoff from this stream =     53.150(CFS)
Time of concentration =   14.21 min.
Rainfall intensity =     4.701(In/Hr)
Summary of stream data:

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


1        1.617      6.35               7.904
2       53.150     14.21               4.701
Qmax(1) =
          1.000 *    1.000 *     1.617) +
          1.000 *    0.447 *    53.150) + =      25.367
Qmax(2) =
          0.595 *    1.000 *     1.617) +
          1.000 *    1.000 *    53.150) + =      54.112
```

```
Total of 2 streams to confluence:
Flow rates before confluence point:
       1.617      53.150
Maximum flow rates at confluence using above data:
       25.367       54.112
Area of streams before confluence:
        0.341       30.120
Results of confluence:
Total flow rate =     54.112(CFS)
Time of concentration =    14.212 min.
Effective stream area after confluence =     30.461(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.000 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   692.400(Ft.)
Downstream point/station elevation =   692.000(Ft.)
Pipe length  =    10.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    54.112(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    54.112(CFS)
Normal flow depth in pipe =   19.55(In.)
Flow top width inside pipe =   24.14(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.56(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =    14.22 min.


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Process from Point/Station       13.000 to Point/Station       13.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     30.461(Ac.)
Runoff from this stream =     54.112(CFS)
Time of concentration =   14.22 min.
Rainfall intensity =     4.699(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        7.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   94.000(Ft.)
Highest elevation =  750.000(Ft.)
Lowest elevation =  745.000(Ft.)
Elevation difference =    5.000(Ft.) Slope =  5.319 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   5.32 %, in a development type of
 10.9 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =   5.70 minutes
 (for slope value of   5.00 %)
Rainfall intensity (I) =      8.474(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.422(CFS)
Total initial stream area =        0.083(Ac.)
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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        8.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________
Upstream point/station elevation =   737.000(Ft.)
Downstream point/station elevation =   733.000(Ft.)
Pipe length  =    54.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.422(CFS)
Given pipe size =      6.00(In.)
Calculated individual pipe flow  =     0.422(CFS)
Normal flow depth in pipe =    2.16(In.)
Flow top width inside pipe =    5.76(In.)
Critical Depth =    3.97(In.)
Pipe flow velocity =      6.65(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     5.84 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        8.000 to Point/Station        8.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     5.84 min.
Rainfall intensity =      8.347(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.086
Subarea runoff =      0.299(CFS) for      0.061(Ac.)
Total runoff =      0.721(CFS)        Total area =       0.144(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        8.000 to Point/Station        9.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________
Upstream point/station elevation =   733.000(Ft.)
Downstream point/station elevation =   729.000(Ft.)
Pipe length  =    50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.721(CFS)
Given pipe size =      6.00(In.)
Calculated individual pipe flow  =     0.721(CFS)
Normal flow depth in pipe =    2.84(In.)
Flow top width inside pipe =    5.99(In.)
Critical Depth =    5.12(In.)
Pipe flow velocity =      7.89(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =     5.94 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station        9.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     5.94 min.
Rainfall intensity =      8.251(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
```

```
(Q=KCIA) is C = 0.600  CA =      0.118
Subarea runoff =      0.254(CFS) for      0.053(Ac.)
Total runoff =      0.975(CFS)        Total area =       0.197(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station       10.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   729.000(Ft.)
Downstream point/station elevation =   722.000(Ft.)
Pipe length  =    77.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.975(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.975(CFS)
Normal flow depth in pipe =    3.27(In.)
Flow top width inside pipe =    5.98(In.)
Critical Depth =    5.64(In.)
Pipe flow velocity =      8.92(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     6.08 min.


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Process from Point/Station       10.000 to Point/Station       10.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.08 min.
Rainfall intensity =      8.125(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.151
Subarea runoff =      0.248(CFS) for      0.054(Ac.)
Total runoff =      1.224(CFS)        Total area =       0.251(Ac.)


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Process from Point/Station       10.000 to Point/Station       11.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   722.000(Ft.)
Downstream point/station elevation =   712.000(Ft.)
Pipe length  =    99.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.224(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.224(CFS)
Normal flow depth in pipe =    3.65(In.)
Flow top width inside pipe =    5.86(In.)
Critical depth could not be calculated.
Pipe flow velocity =      9.79(Ft/s)
Travel time through pipe =    0.17 min.
Time of concentration (TC) =     6.25 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       11.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
```

```
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.25 min.
Rainfall intensity =      7.983(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.191
Subarea runoff =      0.304(CFS) for      0.068(Ac.)
Total runoff =      1.528(CFS)        Total area =       0.319(Ac.)


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Process from Point/Station       11.000 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   712.000(Ft.)
Downstream point/station elevation =   709.000(Ft.)
Pipe length  =    99.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.528(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.528(CFS)
Normal flow depth in pipe =    4.66(In.)
Flow top width inside pipe =    8.99(In.)
Critical Depth =    6.83(In.)
Pipe flow velocity =      6.62(Ft/s)
Travel time through pipe =    0.25 min.
Time of concentration (TC) =     6.50 min.


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Process from Point/Station       12.000 to Point/Station       12.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.50 min.
Rainfall intensity =      7.784(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.224
Subarea runoff =      0.219(CFS) for      0.055(Ac.)
Total runoff =      1.747(CFS)        Total area =       0.374(Ac.)


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Process from Point/Station       12.000 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   709.000(Ft.)
Downstream point/station elevation =   692.000(Ft.)
Pipe length  =    34.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.747(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.747(CFS)
Normal flow depth in pipe =    2.79(In.)
Flow top width inside pipe =    5.98(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.57(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     6.53 min.


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Process from Point/Station       13.000 to Point/Station       13.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
```

```
Stream flow area =      0.374(Ac.)
Runoff from this stream =      1.747(CFS)
Time of concentration =    6.53 min.
Rainfall intensity =     7.761(In/Hr)
Summary of stream data:

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


1       54.112     14.22               4.699
2        1.747      6.53               7.761
Qmax(1) =
          1.000 *    1.000 *    54.112) +
          0.605 *    1.000 *     1.747) + =      55.169
Qmax(2) =
          1.000 *    0.459 *    54.112) +
          1.000 *    1.000 *     1.747) + =      26.600

Total of 2 streams to confluence:
Flow rates before confluence point:
      54.112       1.747
Maximum flow rates at confluence using above data:
       55.169       26.600
Area of streams before confluence:
       30.461        0.374
Results of confluence:
Total flow rate =     55.169(CFS)
Time of concentration =    14.222 min.
Effective stream area after confluence =     30.835(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   692.000(Ft.)
Downstream point/station elevation =   691.300(Ft.)
Pipe length  =    83.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    55.169(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    55.169(CFS)
Normal flow depth in pipe =   26.72(In.)
Flow top width inside pipe =   31.49(In.)
Critical Depth =   28.94(In.)
Pipe flow velocity =      9.81(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =    14.36 min.


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Process from Point/Station       14.000 to Point/Station       14.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
The area added to the existing stream causes a
a lower flow rate of Q =     51.409(CFS)
therefore the upstream flow rate of Q =     55.169(CFS) is being used
Time of concentration =    14.36 min.
Rainfall intensity =      4.669(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.356  CA =     11.011
Subarea runoff =      0.000(CFS) for      0.066(Ac.)
Total runoff =     55.169(CFS)        Total area =      30.901(Ac.)
```

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Process from Point/Station       14.000 to Point/Station       14.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     30.901(Ac.)
Runoff from this stream =     55.169(CFS)
Time of concentration =   14.36 min.
Rainfall intensity =     4.669(In/Hr)


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Process from Point/Station        6.000 to Point/Station       14.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   83.000(Ft.)
Highest elevation =  715.000(Ft.)
Lowest elevation =  707.000(Ft.)
Elevation difference =    8.000(Ft.) Slope =  9.639 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   9.64 %, in a development type of
 10.9 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =   4.50 minutes
 (for slope value of  10.00 %)
Calculated TC of    4.500 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.365(CFS)
Total initial stream area =        0.066(Ac.)


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Process from Point/Station       14.000 to Point/Station       14.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.066(Ac.)
Runoff from this stream =      0.365(CFS)
Time of concentration =    4.50 min.
Rainfall intensity =     9.222(In/Hr)
Summary of stream data:

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


1       55.169     14.36               4.669
2        0.365      4.50               9.222
Qmax(1) =
          1.000 *    1.000 *    55.169) +
          0.506 *    1.000 *     0.365) + =      55.354
Qmax(2) =
          1.000 *    0.313 *    55.169) +
          1.000 *    1.000 *     0.365) + =      17.650

Total of 2 streams to confluence:
Flow rates before confluence point:
      55.169       0.365
```

```
Maximum flow rates at confluence using above data:
       55.354       17.650
Area of streams before confluence:
       30.901        0.066
Results of confluence:
Total flow rate =     55.354(CFS)
Time of concentration =    14.363 min.
Effective stream area after confluence =     30.967(Ac.)


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Process from Point/Station       14.000 to Point/Station       19.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   691.300(Ft.)
Downstream point/station elevation =   690.700(Ft.)
Pipe length  =    58.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    55.354(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    55.354(CFS)
Normal flow depth in pipe =   24.70(In.)
Flow top width inside pipe =   33.41(In.)
Critical Depth =   28.97(In.)
Pipe flow velocity =     10.70(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =    14.45 min.


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Process from Point/Station       19.000 to Point/Station       19.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     30.967(Ac.)
Runoff from this stream =     55.354(CFS)
Time of concentration =   14.45 min.
Rainfall intensity =     4.650(In/Hr)


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Process from Point/Station       12.000 to Point/Station       17.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   74.000(Ft.)
Highest elevation =  713.000(Ft.)
Lowest elevation =  706.000(Ft.)
Elevation difference =    7.000(Ft.) Slope =  9.459 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   9.46 %, in a development type of
 10.9 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =   4.50 minutes
 (for slope value of  10.00 %)
Calculated TC of    4.500 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.315(CFS)
Total initial stream area =        0.057(Ac.)


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Process from Point/Station       17.000 to Point/Station       18.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   700.000(Ft.)
Downstream point/station elevation =   695.000(Ft.)
Pipe length  =    52.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.315(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.315(CFS)
Normal flow depth in pipe =    1.73(In.)
Flow top width inside pipe =    5.43(In.)
Critical Depth =    3.41(In.)
Pipe flow velocity =      6.72(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =     4.63 min.


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Process from Point/Station       18.000 to Point/Station       18.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     4.63 min.
Rainfall intensity =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.056
Subarea runoff =      0.205(CFS) for      0.037(Ac.)
Total runoff =      0.520(CFS)        Total area =       0.094(Ac.)


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Process from Point/Station       18.000 to Point/Station       19.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   695.000(Ft.)
Downstream point/station elevation =   690.700(Ft.)
Pipe length  =    38.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.520(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.520(CFS)
Normal flow depth in pipe =    2.16(In.)
Flow top width inside pipe =    5.76(In.)
Critical Depth =    4.41(In.)
Pipe flow velocity =      8.21(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =     4.71 min.


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Process from Point/Station       19.000 to Point/Station       19.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.094(Ac.)
Runoff from this stream =      0.520(CFS)
Time of concentration =    4.71 min.
Rainfall intensity =     9.222(In/Hr)
Summary of stream data:

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


1       55.354     14.45               4.650
```

```
2        0.520      4.71               9.222
Qmax(1) =
          1.000 *    1.000 *    55.354) +
          0.504 *    1.000 *     0.520) + =      55.616
Qmax(2) =
          1.000 *    0.326 *    55.354) +
          1.000 *    1.000 *     0.520) + =      18.544

Total of 2 streams to confluence:
Flow rates before confluence point:
      55.354       0.520
Maximum flow rates at confluence using above data:
       55.616       18.544
Area of streams before confluence:
       30.967        0.094
Results of confluence:
Total flow rate =     55.616(CFS)
Time of concentration =    14.453 min.
Effective stream area after confluence =     31.061(Ac.)


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Process from Point/Station       19.000 to Point/Station       15.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   690.700(Ft.)
Downstream point/station elevation =   690.000(Ft.)
Pipe length  =    41.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    55.616(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    55.616(CFS)
Normal flow depth in pipe =   22.43(In.)
Flow top width inside pipe =   30.80(In.)
Critical Depth =   29.11(In.)
Pipe flow velocity =     12.94(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    14.51 min.


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Process from Point/Station       15.000 to Point/Station       15.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
The area added to the existing stream causes a
a lower flow rate of Q =     51.729(CFS)
therefore the upstream flow rate of Q =     55.616(CFS) is being used
Time of concentration =    14.51 min.
Rainfall intensity =      4.639(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.358  CA =     11.150
Subarea runoff =      0.000(CFS) for      0.073(Ac.)
Total runoff =     55.616(CFS)        Total area =      31.134(Ac.)


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Process from Point/Station       15.000 to Point/Station       21.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   690.000(Ft.)
Downstream point/station elevation =   687.000(Ft.)
Pipe length  =    62.50(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    55.616(CFS)
Nearest computed pipe diameter  =     27.00(In.)
```

```
Calculated individual pipe flow  =    55.616(CFS)
Normal flow depth in pipe =   18.61(In.)
Flow top width inside pipe =   24.99(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.04(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    14.56 min.


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Process from Point/Station       21.000 to Point/Station       21.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     31.134(Ac.)
Runoff from this stream =     55.616(CFS)
Time of concentration =   14.56 min.
Rainfall intensity =     4.628(In/Hr)


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Process from Point/Station       18.000 to Point/Station       20.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  101.000(Ft.)
Highest elevation =  701.000(Ft.)
Lowest elevation =  693.000(Ft.)
Elevation difference =    8.000(Ft.) Slope =  7.921 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   7.92 %, in a development type of
 10.9 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =   4.50 minutes
 (for slope value of  10.00 %)
Calculated TC of    4.500 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.404(CFS)
Total initial stream area =        0.073(Ac.)


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Process from Point/Station       20.000 to Point/Station       21.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   688.000(Ft.)
Downstream point/station elevation =   687.000(Ft.)
Pipe length  =    40.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.404(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.404(CFS)
Normal flow depth in pipe =    2.84(In.)
Flow top width inside pipe =    5.99(In.)
Critical Depth =    3.88(In.)
Pipe flow velocity =      4.41(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =     4.65 min.


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Process from Point/Station       21.000 to Point/Station       21.000
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**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.073(Ac.)
Runoff from this stream =      0.404(CFS)
Time of concentration =    4.65 min.
Rainfall intensity =     9.222(In/Hr)
Summary of stream data:

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


1       55.616     14.56               4.628
2        0.404      4.65               9.222
Qmax(1) =
          1.000 *    1.000 *    55.616) +
          0.502 *    1.000 *     0.404) + =      55.819
Qmax(2) =
          1.000 *    0.319 *    55.616) +
          1.000 *    1.000 *     0.404) + =      18.170

Total of 2 streams to confluence:
Flow rates before confluence point:
      55.616       0.404
Maximum flow rates at confluence using above data:
       55.819       18.170
Area of streams before confluence:
       31.134        0.073
Results of confluence:
Total flow rate =     55.819(CFS)
Time of concentration =    14.560 min.
Effective stream area after confluence =     31.207(Ac.)


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Process from Point/Station       21.000 to Point/Station       16.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________
Upstream point/station elevation =   687.000(Ft.)
Downstream point/station elevation =   686.800(Ft.)
Pipe length  =    12.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    55.819(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    55.819(CFS)
Normal flow depth in pipe =   22.69(In.)
Flow top width inside pipe =   30.59(In.)
Critical Depth =   29.16(In.)
Pipe flow velocity =     12.82(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =    14.58 min.


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Process from Point/Station       16.000 to Point/Station       16.000
**** SUBAREA FLOW ADDITION ****
____________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
The area added to the existing stream causes a
a lower flow rate of Q =     51.921(CFS)
therefore the upstream flow rate of Q =     55.819(CFS) is being used
Time of concentration =    14.58 min.
Rainfall intensity =      4.625(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
```

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(Q=KCIA) is C = 0.359  CA =     11.227
Subarea runoff =      0.000(CFS) for      0.054(Ac.)
Total runoff =     55.819(CFS)        Total area =      31.261(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       16.000 to Point/Station       43.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   686.800(Ft.)
Downstream point/station elevation =   684.000(Ft.)
Pipe length  =    12.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    55.819(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    55.819(CFS)
Normal flow depth in pipe =   13.31(In.)
Flow top width inside pipe =   20.23(In.)
Critical depth could not be calculated.
Pipe flow velocity =     34.73(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =    14.58 min.


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Process from Point/Station       43.000 to Point/Station       43.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     31.261(Ac.)
Runoff from this stream =     55.819(CFS)
Time of concentration =   14.58 min.
Rainfall intensity =     4.624(In/Hr)


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Process from Point/Station       43.000 to Point/Station       43.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      6.312(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   9.00 min.  Rain intensity =       6.31(In/Hr)
Total area =        3.835(Ac.)  Total runoff =    14.250(CFS)


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Process from Point/Station       43.000 to Point/Station       43.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.835(Ac.)
Runoff from this stream =     14.250(CFS)
Time of concentration =    9.00 min.
Rainfall intensity =     6.312(In/Hr)
Summary of stream data:

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


1       55.819     14.58               4.624
2       14.250      9.00               6.312
Qmax(1) =
          1.000 *    1.000 *    55.819) +
```

```
          0.733 *    1.000 *    14.250) + =      66.258
Qmax(2) =
          1.000 *    0.617 *    55.819) +
          1.000 *    1.000 *    14.250) + =      48.702

Total of 2 streams to confluence:
Flow rates before confluence point:
      55.819      14.250
Maximum flow rates at confluence using above data:
       66.258       48.702
Area of streams before confluence:
       31.261        3.835
Results of confluence:
Total flow rate =     66.258(CFS)
Time of concentration =    14.582 min.
Effective stream area after confluence =     35.096(Ac.)


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Process from Point/Station       43.000 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   684.600(Ft.)
Downstream point/station elevation =   680.500(Ft.)
Pipe length  =    81.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    66.258(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    66.258(CFS)
Normal flow depth in pipe =   21.02(In.)
Flow top width inside pipe =   22.42(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.94(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    14.65 min.


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Process from Point/Station       22.000 to Point/Station       22.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
The area added to the existing stream causes a
a lower flow rate of Q =     62.565(CFS)
therefore the upstream flow rate of Q =     66.258(CFS) is being used
Time of concentration =    14.65 min.
Rainfall intensity =      4.610(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.386  CA =     13.572
Subarea runoff =      0.000(CFS) for      0.074(Ac.)
Total runoff =     66.258(CFS)        Total area =      35.170(Ac.)


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Process from Point/Station       22.000 to Point/Station       24.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   680.500(Ft.)
Downstream point/station elevation =   674.300(Ft.)
Pipe length  =    80.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    66.258(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    66.258(CFS)
Normal flow depth in pipe =   17.74(In.)
Flow top width inside pipe =   25.63(In.)
```

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Critical depth could not be calculated.
Pipe flow velocity =     23.91(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    14.71 min.


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Process from Point/Station       24.000 to Point/Station       24.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     35.170(Ac.)
Runoff from this stream =     66.258(CFS)
Time of concentration =   14.71 min.
Rainfall intensity =     4.599(In/Hr)


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Process from Point/Station       20.000 to Point/Station       23.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  191.000(Ft.)
Highest elevation =  693.000(Ft.)
Lowest elevation =  680.000(Ft.)
Elevation difference =   13.000(Ft.) Slope =  6.806 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   6.81 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.75 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*( 100.000^.5)/(   6.806^(1/3)]=   4.75
Rainfall intensity (I) =      9.533(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.949(CFS)
Total initial stream area =        0.166(Ac.)


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Process from Point/Station       23.000 to Point/Station       24.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   675.500(Ft.)
Downstream point/station elevation =   674.300(Ft.)
Pipe length  =    33.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.949(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.949(CFS)
Normal flow depth in pipe =    4.39(In.)
Flow top width inside pipe =    5.31(In.)
Critical Depth =    5.60(In.)
Pipe flow velocity =      6.15(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =     4.84 min.


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Process from Point/Station       24.000 to Point/Station       24.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.166(Ac.)
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```
Runoff from this stream =      0.949(CFS)
Time of concentration =    4.84 min.
Rainfall intensity =     9.419(In/Hr)
Summary of stream data:

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


1       66.258     14.71               4.599
2        0.949      4.84               9.419
Qmax(1) =
          1.000 *    1.000 *    66.258) +
          0.488 *    1.000 *     0.949) + =      66.721
Qmax(2) =
          1.000 *    0.329 *    66.258) +
          1.000 *    1.000 *     0.949) + =      22.750

Total of 2 streams to confluence:
Flow rates before confluence point:
      66.258       0.949
Maximum flow rates at confluence using above data:
       66.721       22.750
Area of streams before confluence:
       35.170        0.166
Results of confluence:
Total flow rate =     66.721(CFS)
Time of concentration =    14.705 min.
Effective stream area after confluence =     35.336(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.000 to Point/Station       25.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   674.300(Ft.)
Downstream point/station elevation =   673.500(Ft.)
Pipe length  =    50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    66.721(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    66.721(CFS)
Normal flow depth in pipe =   26.95(In.)
Flow top width inside pipe =   25.53(In.)
Critical Depth =   30.76(In.)
Pipe flow velocity =     12.84(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    14.77 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.000 to Point/Station       25.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     35.336(Ac.)
Runoff from this stream =     66.721(CFS)
Time of concentration =   14.77 min.
Rainfall intensity =     4.586(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.200 to Point/Station       25.100
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
```

```
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  237.000(Ft.)
Highest elevation =  732.000(Ft.)
Lowest elevation =  710.500(Ft.)
Elevation difference =   21.500(Ft.) Slope =  9.072 %
Top of Initial Area Slope adjusted by User to 11.400 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  11.40 %, in a development type of
 Permanent Open Space
In Accordance With Table 3-2
Initial Area Time of Concentration =   6.90 minutes
 (for slope value of  10.00 %)
Rainfall intensity (I) =      7.492(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      6.975(CFS)
Total initial stream area =        2.660(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.100 to Point/Station       25.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   705.000(Ft.)
Downstream point/station elevation =   673.500(Ft.)
Pipe length  =   193.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.975(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     6.975(CFS)
Normal flow depth in pipe =    5.89(In.)
Flow top width inside pipe =   12.00(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.18(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =     7.08 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.000 to Point/Station       25.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.660(Ac.)
Runoff from this stream =      6.975(CFS)
Time of concentration =    7.08 min.
Rainfall intensity =     7.370(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       25.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  130.000(Ft.)
Highest elevation =  685.000(Ft.)
Lowest elevation =  678.000(Ft.)
Elevation difference =    7.000(Ft.) Slope =  5.385 %
Top of Initial Area Slope adjusted by User to  5.750 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   5.75 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.02 minutes
```

```
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*( 100.000^.5)/(   5.750^(1/3)]=   5.02
Rainfall intensity (I) =      9.194(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.530(CFS)
Total initial stream area =        0.096(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.000 to Point/Station       25.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.096(Ac.)
Runoff from this stream =      0.530(CFS)
Time of concentration =    5.02 min.
Rainfall intensity =     9.194(In/Hr)
Summary of stream data:

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


1       66.721     14.77               4.586
2        6.975      7.08               7.370
3        0.530      5.02               9.194
Qmax(1) =
          1.000 *    1.000 *    66.721) +
          0.622 *    1.000 *     6.975) +
          0.499 *    1.000 *     0.530) + =      71.325
Qmax(2) =
          1.000 *    0.479 *    66.721) +
          1.000 *    1.000 *     6.975) +
          0.802 *    1.000 *     0.530) + =      39.368
Qmax(3) =
          1.000 *    0.340 *    66.721) +
          1.000 *    0.710 *     6.975) +
          1.000 *    1.000 *     0.530) + =      28.174

Total of 3 streams to confluence:
Flow rates before confluence point:
      66.721       6.975       0.530
Maximum flow rates at confluence using above data:
       71.325       39.368       28.174
Area of streams before confluence:
       35.336        2.660        0.096
Results of confluence:
Total flow rate =     71.325(CFS)
Time of concentration =    14.770 min.
Effective stream area after confluence =     38.092(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.000 to Point/Station       26.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   673.500(Ft.)
Downstream point/station elevation =   669.000(Ft.)
Pipe length  =   111.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    71.325(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    71.325(CFS)
Normal flow depth in pipe =   21.52(In.)
Flow top width inside pipe =   27.02(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.93(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =    14.87 min.


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Process from Point/Station       26.000 to Point/Station       26.000
**** SUBAREA FLOW ADDITION ****
____________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
The area added to the existing stream causes a
a lower flow rate of Q =     67.210(CFS)
therefore the upstream flow rate of Q =     71.325(CFS) is being used
Time of concentration =    14.87 min.
Rainfall intensity =      4.566(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.385  CA =     14.720
Subarea runoff =      0.000(CFS) for      0.099(Ac.)
Total runoff =     71.325(CFS)        Total area =      38.191(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.000 to Point/Station       26.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     38.191(Ac.)
Runoff from this stream =     71.325(CFS)
Time of concentration =   14.87 min.
Rainfall intensity =     4.566(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.000 to Point/Station       26.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  110.000(Ft.)
Highest elevation =  678.000(Ft.)
Lowest elevation =  673.500(Ft.)
Elevation difference =    4.500(Ft.) Slope =  4.091 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   4.09 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.63 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*( 100.000^.5)/(   4.091^(1/3)]=   5.63
Rainfall intensity (I) =      8.545(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.508(CFS)
Total initial stream area =        0.099(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.000 to Point/Station       26.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.099(Ac.)
Runoff from this stream =      0.508(CFS)
Time of concentration =    5.63 min.
```

```
Rainfall intensity =     8.545(In/Hr)
Summary of stream data:

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


1       71.325     14.87               4.566
2        0.508      5.63               8.545
Qmax(1) =
          1.000 *    1.000 *    71.325) +
          0.534 *    1.000 *     0.508) + =      71.596
Qmax(2) =
          1.000 *    0.378 *    71.325) +
          1.000 *    1.000 *     0.508) + =      27.503

Total of 2 streams to confluence:
Flow rates before confluence point:
      71.325       0.508
Maximum flow rates at confluence using above data:
       71.596       27.503
Area of streams before confluence:
       38.191        0.099
Results of confluence:
Total flow rate =     71.596(CFS)
Time of concentration =    14.868 min.
Effective stream area after confluence =     38.290(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.000 to Point/Station       63.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   669.000(Ft.)
Downstream point/station elevation =   662.000(Ft.)
Pipe length  =   148.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    71.596(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    71.596(CFS)
Normal flow depth in pipe =   20.34(In.)
Flow top width inside pipe =   28.03(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.20(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =    14.99 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       63.000 to Point/Station       63.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     38.290(Ac.)
Runoff from this stream =     71.596(CFS)
Time of concentration =   14.99 min.
Rainfall intensity =     4.542(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       27.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
```

```
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  111.000(Ft.)
Highest elevation =  680.000(Ft.)
Lowest elevation =  675.000(Ft.)
Elevation difference =    5.000(Ft.) Slope =  4.505 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   4.50 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.45 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*( 100.000^.5)/(   4.505^(1/3)]=   5.45
Rainfall intensity (I) =      8.724(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.445(CFS)
Total initial stream area =        0.085(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       27.000 to Point/Station       28.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   670.000(Ft.)
Downstream point/station elevation =   664.000(Ft.)
Pipe length  =    76.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.445(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.445(CFS)
Normal flow depth in pipe =    2.18(In.)
Flow top width inside pipe =    5.77(In.)
Critical Depth =    4.08(In.)
Pipe flow velocity =      6.90(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =     5.63 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       28.000 to Point/Station       28.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     5.63 min.
Rainfall intensity =      8.539(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.085
Subarea runoff =      0.278(CFS) for      0.056(Ac.)
Total runoff =      0.722(CFS)        Total area =       0.141(Ac.)


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Process from Point/Station       28.000 to Point/Station       29.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   664.000(Ft.)
Downstream point/station elevation =   663.000(Ft.)
Pipe length  =    66.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.722(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.722(CFS)
Normal flow depth in pipe =    3.70(In.)
Flow top width inside pipe =    8.86(In.)
Critical Depth =    4.65(In.)
Pipe flow velocity =      4.22(Ft/s)
```

```
Travel time through pipe =    0.26 min.
Time of concentration (TC) =     5.89 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       29.000 to Point/Station       29.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     5.89 min.
Rainfall intensity =      8.293(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.122
Subarea runoff =      0.288(CFS) for      0.062(Ac.)
Total runoff =      1.010(CFS)        Total area =       0.203(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       29.000 to Point/Station       29.100
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   663.000(Ft.)
Downstream point/station elevation =   662.500(Ft.)
Pipe length  =    32.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.010(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.010(CFS)
Normal flow depth in pipe =    4.44(In.)
Flow top width inside pipe =    9.00(In.)
Critical Depth =    5.53(In.)
Pipe flow velocity =      4.65(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =     6.01 min.


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Process from Point/Station       29.100 to Point/Station       29.100
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      0.203(Ac.)
Runoff from this stream =      1.010(CFS)
Time of concentration =    6.01 min.
Rainfall intensity =     8.191(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       62.000 to Point/Station       62.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      6.312(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   9.00 min.  Rain intensity =       6.31(In/Hr)
Total area =       51.810(Ac.)  Total runoff =   135.500(CFS)
```

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Process from Point/Station       62.000 to Point/Station       29.100
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   663.000(Ft.)
Downstream point/station elevation =   662.500(Ft.)
Pipe length  =    34.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   135.500(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =   135.500(CFS)
Normal flow depth in pipe =   34.13(In.)
Flow top width inside pipe =   38.53(In.)
Critical Depth =   41.17(In.)
Pipe flow velocity =     15.07(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =     9.04 min.


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Process from Point/Station       29.100 to Point/Station       29.100
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     51.810(Ac.)
Runoff from this stream =    135.500(CFS)
Time of concentration =    9.04 min.
Rainfall intensity =     6.295(In/Hr)
Summary of stream data:

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


1        1.010      6.01               8.191
2      135.500      9.04               6.295
Qmax(1) =
          1.000 *    1.000 *     1.010) +
          1.000 *    0.665 *   135.500) + =      91.094
Qmax(2) =
          0.769 *    1.000 *     1.010) +
          1.000 *    1.000 *   135.500) + =     136.276

Total of 2 streams to confluence:
Flow rates before confluence point:
       1.010     135.500
Maximum flow rates at confluence using above data:
       91.094      136.276
Area of streams before confluence:
        0.203       51.810
Results of confluence:
Total flow rate =    136.276(CFS)
Time of concentration =     9.038 min.
Effective stream area after confluence =     52.013(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       29.100 to Point/Station       63.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   662.500(Ft.)
Downstream point/station elevation =   662.000(Ft.)
Pipe length  =    36.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   136.276(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =   136.276(CFS)
Normal flow depth in pipe =   35.25(In.)
Flow top width inside pipe =   37.08(In.)
Critical Depth =   41.24(In.)
Pipe flow velocity =     14.69(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =     9.08 min.
```

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Process from Point/Station       63.000 to Point/Station       63.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     52.013(Ac.)
Runoff from this stream =    136.276(CFS)
Time of concentration =    9.08 min.
Rainfall intensity =     6.277(In/Hr)
Summary of stream data:

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


1       71.596     14.99               4.542
2      136.276      9.08               6.277
Qmax(1) =
          1.000 *    1.000 *    71.596) +
          0.724 *    1.000 *   136.276) + =     170.212
Qmax(2) =
          1.000 *    0.606 *    71.596) +
          1.000 *    1.000 *   136.276) + =     179.637

Total of 2 main streams to confluence:
Flow rates before confluence point:
      71.596     136.276
Maximum flow rates at confluence using above data:
      170.212      179.637
Area of streams before confluence:
       38.290       52.013


Results of confluence:
Total flow rate =    179.637(CFS)
Time of concentration =     9.078 min.
Effective stream area after confluence  =     90.303(Ac.)


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Process from Point/Station       63.000 to Point/Station       66.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   662.000(Ft.)
Downstream point/station elevation =   661.000(Ft.)
Pipe length  =   114.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   179.637(CFS)
Nearest computed pipe diameter  =     54.00(In.)
Calculated individual pipe flow  =   179.637(CFS)
Normal flow depth in pipe =   43.13(In.)
Flow top width inside pipe =   43.31(In.)
Critical Depth =   46.58(In.)
Pipe flow velocity =     13.20(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     9.22 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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 =     90.303(Ac.)
Runoff from this stream =    179.637(CFS)
Time of concentration =    9.22 min.
Rainfall intensity =     6.213(In/Hr)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.000 to Point/Station       65.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  262.000(Ft.)
Highest elevation =  673.500(Ft.)
Lowest elevation =  669.000(Ft.)
Elevation difference =    4.500(Ft.) Slope =  1.718 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 80.00 (Ft)
for the top area slope value of   1.72 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.72 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  80.000^.5)/(   1.718^(1/3)]=   6.72
Rainfall intensity (I) =      7.620(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.960(CFS)
Total initial stream area =        0.210(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       65.000 to Point/Station       65.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.210(Ac.)
Runoff from this stream =      0.960(CFS)
Time of concentration =    6.72 min.
Rainfall intensity =     7.620(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       29.000 to Point/Station       64.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  163.000(Ft.)
Highest elevation =  670.500(Ft.)
Lowest elevation =  668.500(Ft.)
Elevation difference =    2.000(Ft.) Slope =  1.227 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 65.00 (Ft)
for the top area slope value of   1.23 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.78 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  65.000^.5)/(   1.227^(1/3)]=   6.78
Rainfall intensity (I) =      7.579(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.950(CFS)
Total initial stream area =        0.209(Ac.)
```

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Process from Point/Station       64.000 to Point/Station       66.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   664.000(Ft.)
Downstream point/station elevation =   661.000(Ft.)
Pipe length  =    37.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.950(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.950(CFS)
Normal flow depth in pipe =    3.33(In.)
Flow top width inside pipe =    5.96(In.)
Critical Depth =    5.61(In.)
Pipe flow velocity =      8.49(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =     6.85 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       66.000 to Point/Station       66.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.209(Ac.)
Runoff from this stream =      0.950(CFS)
Time of concentration =    6.85 min.
Rainfall intensity =     7.527(In/Hr)
Summary of stream data:

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


1      179.637      9.22               6.213
2        0.960      6.72               7.620
3        0.950      6.85               7.527
Qmax(1) =
          1.000 *    1.000 *   179.637) +
          0.815 *    1.000 *     0.960) +
          0.825 *    1.000 *     0.950) + =     181.205
Qmax(2) =
          1.000 *    0.729 *   179.637) +
          1.000 *    1.000 *     0.960) +
          1.000 *    0.981 *     0.950) + =     132.810
Qmax(3) =
          1.000 *    0.743 *   179.637) +
          0.988 *    1.000 *     0.960) +
          1.000 *    1.000 *     0.950) + =     135.333

Total of 3 streams to confluence:
Flow rates before confluence point:
     179.637       0.960       0.950
Maximum flow rates at confluence using above data:
      181.205      132.810      135.333
Area of streams before confluence:
       90.303        0.210        0.209
Results of confluence:
Total flow rate =    181.205(CFS)
Time of concentration =     9.222 min.
Effective stream area after confluence =     90.722(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       66.000 to Point/Station       81.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   661.000(Ft.)
Downstream point/station elevation =   659.680(Ft.)
Pipe length  =   132.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   181.205(CFS)
Nearest computed pipe diameter  =     54.00(In.)
```

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Calculated individual pipe flow  =   181.205(CFS)
Normal flow depth in pipe =   40.88(In.)
Flow top width inside pipe =   46.32(In.)
Critical Depth =   46.74(In.)
Pipe flow velocity =     14.03(Ft/s)
Travel time through pipe =    0.16 min.
Time of concentration (TC) =     9.38 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       81.000 to Point/Station       81.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     90.722(Ac.)
Runoff from this stream =    181.205(CFS)
Time of concentration =    9.38 min.
Rainfall intensity =     6.146(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      516.000 to Point/Station      524.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  180.000(Ft.)
Highest elevation =  671.500(Ft.)
Lowest elevation =  666.000(Ft.)
Elevation difference =    5.500(Ft.) Slope =  3.056 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   3.06 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.88 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  90.000^.5)/(   3.056^(1/3)]=   5.88
Rainfall intensity (I) =      8.303(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      1.126(CFS)
Total initial stream area =        0.226(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      524.000 to Point/Station       81.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   661.500(Ft.)
Downstream point/station elevation =   659.680(Ft.)
Pipe length  =    18.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.126(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.126(CFS)
Normal flow depth in pipe =    3.46(In.)
Flow top width inside pipe =    5.93(In.)
Critical depth could not be calculated.
Pipe flow velocity =      9.61(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     5.91 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       81.000 to Point/Station       81.000
**** CONFLUENCE OF MINOR STREAMS ****
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____________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.226(Ac.)
Runoff from this stream =      1.126(CFS)
Time of concentration =    5.91 min.
Rainfall intensity =     8.274(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      521.000 to Point/Station      538.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  179.000(Ft.)
Highest elevation =  671.500(Ft.)
Lowest elevation =  665.700(Ft.)
Elevation difference =    5.800(Ft.) Slope =  3.240 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   3.24 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.77 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  90.000^.5)/(   3.240^(1/3)]=   5.77
Rainfall intensity (I) =      8.408(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      1.019(CFS)
Total initial stream area =        0.202(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      538.000 to Point/Station       81.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________
Upstream point/station elevation =   661.000(Ft.)
Downstream point/station elevation =   659.680(Ft.)
Pipe length  =    50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.019(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.019(CFS)
Normal flow depth in pipe =    3.84(In.)
Flow top width inside pipe =    8.90(In.)
Critical Depth =    5.56(In.)
Pipe flow velocity =      5.66(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =     5.92 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       81.000 to Point/Station       81.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.202(Ac.)
Runoff from this stream =      1.019(CFS)
Time of concentration =    5.92 min.
Rainfall intensity =     8.272(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       94.000 to Point/Station       94.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
____________________________________________________________________
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```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      5.243(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.00 min.  Rain intensity =       5.24(In/Hr)
Total area =       12.670(Ac.)  Total runoff =    37.580(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       94.000 to Point/Station       81.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   686.500(Ft.)
Downstream point/station elevation =   655.770(Ft.)
Pipe length  =    73.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    37.580(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    37.580(CFS)
Normal flow depth in pipe =   11.09(In.)
Flow top width inside pipe =   13.17(In.)
Critical depth could not be calculated.
Pipe flow velocity =     38.63(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    12.03 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       81.000 to Point/Station       81.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 4
Stream flow area =     12.670(Ac.)
Runoff from this stream =     37.580(CFS)
Time of concentration =   12.03 min.
Rainfall intensity =     5.234(In/Hr)
Summary of stream data:

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


1      181.205      9.38               6.146
2        1.126      5.91               8.274
3        1.019      5.92               8.272
4       37.580     12.03               5.234
Qmax(1) =
          1.000 *    1.000 *   181.205) +
          0.743 *    1.000 *     1.126) +
          0.743 *    1.000 *     1.019) +
          1.000 *    0.780 *    37.580) + =     212.094
Qmax(2) =
          1.000 *    0.631 *   181.205) +
          1.000 *    1.000 *     1.126) +
          1.000 *    1.000 *     1.019) +
          1.000 *    0.492 *    37.580) + =     134.894
Qmax(3) =
          1.000 *    0.631 *   181.205) +
          1.000 *    1.000 *     1.126) +
          1.000 *    1.000 *     1.019) +
          1.000 *    0.492 *    37.580) + =     134.946
Qmax(4) =
          0.852 *    1.000 *   181.205) +
          0.633 *    1.000 *     1.126) +
          0.633 *    1.000 *     1.019) +
          1.000 *    1.000 *    37.580) + =     193.252
```

```
Total of 4 streams to confluence:
Flow rates before confluence point:
     181.205       1.126       1.019      37.580
Maximum flow rates at confluence using above data:
      212.094      134.894      134.946      193.252
Area of streams before confluence:
       90.722        0.226        0.202       12.670
Results of confluence:
Total flow rate =    212.094(CFS)
Time of concentration =     9.379 min.
Effective stream area after confluence =    103.820(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       81.000 to Point/Station       82.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   655.770(Ft.)
Downstream point/station elevation =   637.000(Ft.)
Pipe length  =   172.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   212.094(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =   212.094(CFS)
Normal flow depth in pipe =   28.36(In.)
Flow top width inside pipe =   29.44(In.)
Critical depth could not be calculated.
Pipe flow velocity =     35.50(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =     9.46 min.
End of computations, total study area =         103.820 (Ac.)
```

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                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2004 Version 7.4

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
        Rational Hydrology Study        Date: 02/15/13
------------------------------------------------------------------------
OUTFALL 4 - Las Posas Road: Node 524-543
POST DEVELOPMENT BEFORE DETENTION
100 Year Storm Event
File Name: 12052OUTFALL4
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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


Program License Serial Number 4012

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      524.000 to Point/Station      525.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   89.000(Ft.)
Highest elevation =  666.000(Ft.)
Lowest elevation =  664.000(Ft.)
Elevation difference =    2.000(Ft.) Slope =  2.247 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 80.00 (Ft)
for the top area slope value of   2.25 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.15 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  80.000^.5)/(   2.247^(1/3)]=   6.15
Rainfall intensity (I) =      8.072(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.421(CFS)
Total initial stream area =        0.087(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      525.000 to Point/Station      526.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   659.500(Ft.)
Downstream point/station elevation =   657.000(Ft.)
Pipe length  =    89.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.421(CFS)
Nearest computed pipe diameter  =      6.00(In.)
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Calculated individual pipe flow  =     0.421(CFS)
Normal flow depth in pipe =    2.82(In.)
Flow top width inside pipe =    5.99(In.)
Critical Depth =    3.97(In.)
Pipe flow velocity =      4.66(Ft/s)
Travel time through pipe =    0.32 min.
Time of concentration (TC) =     6.46 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      526.000 to Point/Station      526.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.46 min.
Rainfall intensity =      7.814(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.104
Subarea runoff =      0.390(CFS) for      0.086(Ac.)
Total runoff =      0.811(CFS)        Total area =       0.173(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      526.000 to Point/Station      527.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   657.000(Ft.)
Downstream point/station elevation =   654.400(Ft.)
Pipe length  =    88.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.811(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.811(CFS)
Normal flow depth in pipe =    4.21(In.)
Flow top width inside pipe =    5.49(In.)
Critical Depth =    5.36(In.)
Pipe flow velocity =      5.50(Ft/s)
Travel time through pipe =    0.27 min.
Time of concentration (TC) =     6.73 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      527.000 to Point/Station      527.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.73 min.
Rainfall intensity =      7.613(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.157
Subarea runoff =      0.381(CFS) for      0.088(Ac.)
Total runoff =      1.192(CFS)        Total area =       0.261(Ac.)


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Process from Point/Station      527.000 to Point/Station      528.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
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Upstream point/station elevation =   654.400(Ft.)
Downstream point/station elevation =   651.000(Ft.)
Pipe length  =    83.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.192(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.192(CFS)
Normal flow depth in pipe =    3.71(In.)
Flow top width inside pipe =    8.86(In.)
Critical Depth =    6.03(In.)
Pipe flow velocity =      6.94(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =     6.93 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      528.000 to Point/Station      528.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.93 min.
Rainfall intensity =      7.471(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.206
Subarea runoff =      0.350(CFS) for      0.083(Ac.)
Total runoff =      1.542(CFS)        Total area =       0.344(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      528.000 to Point/Station      528.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.344(Ac.)
Runoff from this stream =      1.542(CFS)
Time of concentration =    6.93 min.
Rainfall intensity =     7.471(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      556.000 to Point/Station      526.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  426.000(Ft.)
Highest elevation =  737.000(Ft.)
Lowest elevation =  677.000(Ft.)
Elevation difference =   60.000(Ft.) Slope = 14.085 %
Top of Initial Area Slope adjusted by User to 12.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  12.00 %, in a development type of
 10.9 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =   4.50 minutes
 (for slope value of  10.00 %)
Calculated TC of    4.500 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
```

```
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =     10.435(CFS)
Total initial stream area =        1.886(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      526.000 to Point/Station      528.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
!!Warning: Water is above left or right bank elevations
!!Warning: Water is above left or right bank elevations
Estimated mean flow rate at midpoint of channel =     10.684(CFS)
Depth of flow =   0.507(Ft.), Average velocity =  10.379(Ft/s)
!!Warning: Water is above left or right bank elevations
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2              2.00              0.00
       3              4.00              0.50
Manning's 'N' friction factor =   0.014
----------------------------------------------------------------
Sub-Channel flow  =     10.684(CFS)
  '     '       flow top width =      4.000(Ft.)
  '     '    velocity=   10.379(Ft/s)
  '     '       area =      1.029(Sq.Ft)
  '     '       Froude number =     3.605

Upstream point elevation =   661.500(Ft.)
Downstream point elevation =   651.100(Ft.)
Flow length =   171.000(Ft.)
Travel time  =    0.27 min.
Time of concentration =    4.77 min.
Depth of flow =   0.507(Ft.)
Average velocity =  10.379(Ft/s)
Total irregular channel flow =    10.684(CFS)
Irregular channel normal depth above invert elev. =   0.507(Ft.)
Average velocity of channel(s) =  10.379(Ft/s)
!!Warning: Water is above left or right bank elevations
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      9.500(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.590  CA =      1.159
Subarea runoff =      0.571(CFS) for      0.077(Ac.)
Total runoff =     11.006(CFS)       Total area =       1.963(Ac.)
Depth of flow =   0.512(Ft.), Average velocity =  10.503(Ft/s)
!!Warning: Water is above left or right bank elevations


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      528.000 to Point/Station      528.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.963(Ac.)
Runoff from this stream =     11.006(CFS)
Time of concentration =    4.77 min.
Rainfall intensity =     9.500(In/Hr)


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Process from Point/Station      557.000 to Point/Station      528.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  492.000(Ft.)
Highest elevation =  737.000(Ft.)
Lowest elevation =  655.600(Ft.)
Elevation difference =   81.400(Ft.) Slope = 16.545 %
Top of Initial Area Slope adjusted by User to 14.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  14.00 %, in a development type of
 Permanent Open Space
In Accordance With Table 3-2
Initial Area Time of Concentration =   6.90 minutes
 (for slope value of  10.00 %)
Rainfall intensity (I) =      7.492(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      8.115(CFS)
Total initial stream area =        3.095(Ac.)


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Process from Point/Station      528.000 to Point/Station      528.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      3.095(Ac.)
Runoff from this stream =      8.115(CFS)
Time of concentration =    6.90 min.
Rainfall intensity =     7.492(In/Hr)
Summary of stream data:

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


1        1.542      6.93               7.471
2       11.006      4.77               9.500
3        8.115      6.90               7.492
Qmax(1) =
          1.000 *    1.000 *     1.542) +
          0.786 *    1.000 *    11.006) +
          0.997 *    1.000 *     8.115) + =      18.290
Qmax(2) =
          1.000 *    0.689 *     1.542) +
          1.000 *    1.000 *    11.006) +
          1.000 *    0.692 *     8.115) + =      17.684
Qmax(3) =
          1.000 *    0.996 *     1.542) +
          0.789 *    1.000 *    11.006) +
          1.000 *    1.000 *     8.115) + =      18.330

Total of 3 streams to confluence:
Flow rates before confluence point:
       1.542      11.006       8.115
Maximum flow rates at confluence using above data:
       18.290       17.684       18.330
Area of streams before confluence:
        0.344        1.963        3.095
Results of confluence:
Total flow rate =     18.330(CFS)
Time of concentration =     6.900 min.
Effective stream area after confluence =      5.402(Ac.)
```

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Process from Point/Station      528.000 to Point/Station      542.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   651.100(Ft.)
Downstream point/station elevation =   650.500(Ft.)
Pipe length  =    65.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    18.330(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    18.330(CFS)
Normal flow depth in pipe =   16.90(In.)
Flow top width inside pipe =   21.91(In.)
Critical Depth =   18.51(In.)
Pipe flow velocity =      7.76(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     7.04 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      542.000 to Point/Station      542.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      5.402(Ac.)
Runoff from this stream =     18.330(CFS)
Time of concentration =    7.04 min.
Rainfall intensity =     7.396(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      538.000 to Point/Station      539.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   86.000(Ft.)
Highest elevation =  665.700(Ft.)
Lowest elevation =  663.500(Ft.)
Elevation difference =    2.200(Ft.) Slope =  2.558 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   2.56 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.24 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  90.000^.5)/(   2.558^(1/3)]=   6.24
Rainfall intensity (I) =      7.991(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.479(CFS)
Total initial stream area =        0.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      539.000 to Point/Station      540.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   659.000(Ft.)
Downstream point/station elevation =   656.500(Ft.)
Pipe length  =    90.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.479(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.479(CFS)
```

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Normal flow depth in pipe =    3.05(In.)
Flow top width inside pipe =    6.00(In.)
Critical Depth =    4.23(In.)
Pipe flow velocity =      4.79(Ft/s)
Travel time through pipe =    0.31 min.
Time of concentration (TC) =     6.56 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      540.000 to Point/Station      540.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.56 min.
Rainfall intensity =      7.743(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.125
Subarea runoff =      0.492(CFS) for      0.109(Ac.)
Total runoff =      0.971(CFS)       Total area =       0.209(Ac.)


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Process from Point/Station      540.000 to Point/Station      541.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   656.500(Ft.)
Downstream point/station elevation =   653.500(Ft.)
Pipe length  =    78.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.971(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.971(CFS)
Normal flow depth in pipe =    4.38(In.)
Flow top width inside pipe =    5.33(In.)
Critical Depth =    5.63(In.)
Pipe flow velocity =      6.33(Ft/s)
Travel time through pipe =    0.21 min.
Time of concentration (TC) =     6.76 min.


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Process from Point/Station      541.000 to Point/Station      541.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.76 min.
Rainfall intensity =      7.590(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.187
Subarea runoff =      0.445(CFS) for      0.102(Ac.)
Total runoff =      1.416(CFS)       Total area =       0.311(Ac.)


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Process from Point/Station      541.000 to Point/Station      542.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   653.500(Ft.)
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Downstream point/station elevation =   650.500(Ft.)
Pipe length  =    53.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.416(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.416(CFS)
Normal flow depth in pipe =    3.73(In.)
Flow top width inside pipe =    8.87(In.)
Critical Depth =    6.57(In.)
Pipe flow velocity =      8.18(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =     6.87 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      542.000 to Point/Station      542.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.87 min.
Rainfall intensity =      7.513(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.233
Subarea runoff =      0.333(CFS) for      0.077(Ac.)
Total runoff =      1.749(CFS)        Total area =       0.388(Ac.)


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Process from Point/Station      542.000 to Point/Station      542.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.388(Ac.)
Runoff from this stream =      1.749(CFS)
Time of concentration =    6.87 min.
Rainfall intensity =     7.513(In/Hr)
Summary of stream data:

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


1       18.330      7.04               7.396
2        1.749      6.87               7.513
Qmax(1) =
           1.000 *    1.000 *    18.330) +
           0.984 *    1.000 *     1.749) + =      20.052
Qmax(2) =
           1.000 *    0.976 *    18.330) +
           1.000 *    1.000 *     1.749) + =      19.636

Total of 2 streams to confluence:
Flow rates before confluence point:
      18.330       1.749
Maximum flow rates at confluence using above data:
       20.052       19.636
Area of streams before confluence:
        5.402        0.388
Results of confluence:
Total flow rate =     20.052(CFS)
Time of concentration =     7.040 min.
Effective stream area after confluence =      5.790(Ac.)


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Process from Point/Station      542.000 to Point/Station      543.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =   650.500(Ft.)
Downstream point/station elevation =   630.000(Ft.)
Pipe length  =    66.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    20.052(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    20.052(CFS)
Normal flow depth in pipe =    8.00(In.)
Flow top width inside pipe =   14.97(In.)
Critical depth could not be calculated.
Pipe flow velocity =     30.13(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =     7.08 min.
End of computations, total study area =           5.790 (Ac.)
```

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                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2004 Version 7.4

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
        Rational Hydrology Study        Date: 02/15/13
----------------------------------------------------------------------
OUTFALL 5 - Las Posas Road: Node 528-552
POST DEVELOPMENT BEFORE DETENTION
100 Year Storm Event
File Name: 12052OUTFALL5
----------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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


Program License Serial Number 4012

----------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      528.000 to Point/Station      529.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   86.000(Ft.)
Highest elevation =  655.600(Ft.)
Lowest elevation =  652.100(Ft.)
Elevation difference =    3.500(Ft.) Slope =  4.070 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   4.07 %, in a development type of
 10.9 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =   5.70 minutes
 (for slope value of   5.00 %)
Rainfall intensity (I) =      8.474(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.422(CFS)
Total initial stream area =        0.083(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      529.000 to Point/Station      530.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   647.600(Ft.)
Downstream point/station elevation =   644.000(Ft.)
Pipe length  =    89.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.422(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.422(CFS)
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Normal flow depth in pipe =    2.54(In.)
Flow top width inside pipe =    5.93(In.)
Critical Depth =    3.97(In.)
Pipe flow velocity =      5.33(Ft/s)
Travel time through pipe =    0.28 min.
Time of concentration (TC) =     5.98 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      530.000 to Point/Station      530.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     5.98 min.
Rainfall intensity =      8.218(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.101
Subarea runoff =      0.411(CFS) for      0.086(Ac.)
Total runoff =      0.833(CFS)       Total area =       0.169(Ac.)


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Process from Point/Station      530.000 to Point/Station      531.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   644.000(Ft.)
Downstream point/station elevation =   640.000(Ft.)
Pipe length  =    89.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.833(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.833(CFS)
Normal flow depth in pipe =    3.70(In.)
Flow top width inside pipe =    5.83(In.)
Critical Depth =    5.40(In.)
Pipe flow velocity =      6.56(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =     6.20 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      531.000 to Point/Station      531.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.20 min.
Rainfall intensity =      8.023(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.157
Subarea runoff =      0.423(CFS) for      0.092(Ac.)
Total runoff =      1.256(CFS)       Total area =       0.261(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      531.000 to Point/Station      532.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   640.000(Ft.)
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Downstream point/station elevation =   636.000(Ft.)
Pipe length  =    86.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.256(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.256(CFS)
Normal flow depth in pipe =    3.69(In.)
Flow top width inside pipe =    8.85(In.)
Critical Depth =    6.19(In.)
Pipe flow velocity =      7.37(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =     6.40 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      532.000 to Point/Station      532.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.40 min.
Rainfall intensity =      7.865(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.209
Subarea runoff =      0.386(CFS) for      0.087(Ac.)
Total runoff =      1.642(CFS)        Total area =       0.348(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      532.000 to Point/Station      533.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   636.000(Ft.)
Downstream point/station elevation =   632.000(Ft.)
Pipe length  =    92.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.642(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.642(CFS)
Normal flow depth in pipe =    4.37(In.)
Flow top width inside pipe =    9.00(In.)
Critical Depth =    7.07(In.)
Pipe flow velocity =      7.71(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =     6.60 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      533.000 to Point/Station      533.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.60 min.
Rainfall intensity =      7.711(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.262
Subarea runoff =      0.380(CFS) for      0.089(Ac.)
Total runoff =      2.022(CFS)        Total area =       0.437(Ac.)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      533.000 to Point/Station      534.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   632.000(Ft.)
Downstream point/station elevation =   628.200(Ft.)
Pipe length  =    89.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.022(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.022(CFS)
Normal flow depth in pipe =    4.98(In.)
Flow top width inside pipe =    8.95(In.)
Critical Depth =    7.74(In.)
Pipe flow velocity =      8.06(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =     6.78 min.


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Process from Point/Station      534.000 to Point/Station      534.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.78 min.
Rainfall intensity =      7.576(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.316
Subarea runoff =      0.369(CFS) for      0.089(Ac.)
Total runoff =      2.391(CFS)       Total area =       0.526(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      534.000 to Point/Station      535.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   628.200(Ft.)
Downstream point/station elevation =   624.300(Ft.)
Pipe length  =    88.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.391(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.391(CFS)
Normal flow depth in pipe =    5.48(In.)
Flow top width inside pipe =    8.78(In.)
Critical Depth =    8.21(In.)
Pipe flow velocity =      8.49(Ft/s)
Travel time through pipe =    0.17 min.
Time of concentration (TC) =     6.95 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      535.000 to Point/Station      535.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.95 min.
Rainfall intensity =      7.454(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
```

```
(Q=KCIA) is C = 0.600  CA =      0.367
Subarea runoff =      0.346(CFS) for      0.086(Ac.)
Total runoff =      2.737(CFS)        Total area =       0.612(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      535.000 to Point/Station      536.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   624.300(Ft.)
Downstream point/station elevation =   620.300(Ft.)
Pipe length  =    48.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.737(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.737(CFS)
Normal flow depth in pipe =    4.89(In.)
Flow top width inside pipe =    8.97(In.)
Critical Depth =    8.49(In.)
Pipe flow velocity =     11.18(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =     7.03 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      536.000 to Point/Station      536.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     7.03 min.
Rainfall intensity =      7.405(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.419
Subarea runoff =      0.369(CFS) for      0.087(Ac.)
Total runoff =      3.106(CFS)        Total area =       0.699(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      536.000 to Point/Station      536.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.699(Ac.)
Runoff from this stream =      3.106(CFS)
Time of concentration =    7.03 min.
Rainfall intensity =     7.405(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      557.000 to Point/Station      536.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  648.000(Ft.)
Highest elevation =  737.000(Ft.)
Lowest elevation =  620.000(Ft.)
Elevation difference =  117.000(Ft.) Slope = 18.056 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
```

```
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  18.06 %, in a development type of
 Permanent Open Space
In Accordance With Table 3-2
Initial Area Time of Concentration =   6.90 minutes
 (for slope value of  10.00 %)
Rainfall intensity (I) =      7.492(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      5.349(CFS)
Total initial stream area =        2.040(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      536.000 to Point/Station      536.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Time of concentration =     6.90 min.
Rainfall intensity =      7.492(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      1.027
Subarea runoff =      2.342(CFS) for      0.893(Ac.)
Total runoff =      7.691(CFS)        Total area =       2.933(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      536.000 to Point/Station      536.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.933(Ac.)
Runoff from this stream =      7.691(CFS)
Time of concentration =    6.90 min.
Rainfall intensity =     7.492(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      542.000 to Point/Station      544.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   87.000(Ft.)
Highest elevation =  650.500(Ft.)
Lowest elevation =  647.200(Ft.)
Elevation difference =    3.300(Ft.) Slope =  3.793 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   3.79 %, in a development type of
 10.9 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =   6.40 minutes
 (for slope value of   3.00 %)
Rainfall intensity (I) =      7.864(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.486(CFS)
Total initial stream area =        0.103(Ac.)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      544.000 to Point/Station      545.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   647.200(Ft.)
Downstream point/station elevation =   643.700(Ft.)
Pipe length  =    87.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.486(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.486(CFS)
Normal flow depth in pipe =    2.76(In.)
Flow top width inside pipe =    5.98(In.)
Critical Depth =    4.27(In.)
Pipe flow velocity =      5.52(Ft/s)
Travel time through pipe =    0.26 min.
Time of concentration (TC) =     6.66 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      545.000 to Point/Station      545.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.66 min.
Rainfall intensity =      7.663(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.125
Subarea runoff =      0.470(CFS) for      0.105(Ac.)
Total runoff =      0.956(CFS)        Total area =       0.208(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      545.000 to Point/Station      546.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   643.700(Ft.)
Downstream point/station elevation =   640.300(Ft.)
Pipe length  =    89.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.956(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.956(CFS)
Normal flow depth in pipe =    4.34(In.)
Flow top width inside pipe =    5.37(In.)
Critical Depth =    5.61(In.)
Pipe flow velocity =      6.29(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =     6.90 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      546.000 to Point/Station      546.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.90 min.
Rainfall intensity =      7.493(In/Hr) for a   100.0 year storm
```

```
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.192
Subarea runoff =      0.482(CFS) for      0.112(Ac.)
Total runoff =      1.439(CFS)       Total area =       0.320(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      546.000 to Point/Station      547.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   640.300(Ft.)
Downstream point/station elevation =   637.000(Ft.)
Pipe length  =    91.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.439(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.439(CFS)
Normal flow depth in pipe =    4.27(In.)
Flow top width inside pipe =    8.99(In.)
Critical Depth =    6.63(In.)
Pipe flow velocity =      6.97(Ft/s)
Travel time through pipe =    0.22 min.
Time of concentration (TC) =     7.12 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      547.000 to Point/Station      547.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     7.12 min.
Rainfall intensity =      7.344(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.257
Subarea runoff =      0.447(CFS) for      0.108(Ac.)
Total runoff =      1.886(CFS)       Total area =       0.428(Ac.)


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Process from Point/Station      547.000 to Point/Station      548.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   637.000(Ft.)
Downstream point/station elevation =   633.300(Ft.)
Pipe length  =    90.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.886(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.886(CFS)
Normal flow depth in pipe =    4.83(In.)
Flow top width inside pipe =    8.98(In.)
Critical Depth =    7.52(In.)
Pipe flow velocity =      7.81(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =     7.31 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      548.000 to Point/Station      548.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
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```
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     7.31 min.
Rainfall intensity =      7.219(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.318
Subarea runoff =      0.410(CFS) for      0.102(Ac.)
Total runoff =      2.296(CFS)        Total area =       0.530(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      548.000 to Point/Station      549.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   633.300(Ft.)
Downstream point/station elevation =   629.900(Ft.)
Pipe length  =    90.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.296(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.296(CFS)
Normal flow depth in pipe =    5.63(In.)
Flow top width inside pipe =    8.71(In.)
Critical Depth =    8.11(In.)
Pipe flow velocity =      7.91(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =     7.50 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      549.000 to Point/Station      549.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     7.50 min.
Rainfall intensity =      7.101(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.382
Subarea runoff =      0.418(CFS) for      0.107(Ac.)
Total runoff =      2.714(CFS)        Total area =       0.637(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      549.000 to Point/Station      550.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   629.900(Ft.)
Downstream point/station elevation =   626.500(Ft.)
Pipe length  =    90.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.714(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.714(CFS)
Normal flow depth in pipe =    6.34(In.)
Flow top width inside pipe =    8.21(In.)
Critical Depth =    8.47(In.)
Pipe flow velocity =      8.16(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =     7.68 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      550.000 to Point/Station      550.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
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```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     7.68 min.
Rainfall intensity =      6.991(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.445
Subarea runoff =      0.398(CFS) for      0.105(Ac.)
Total runoff =      3.112(CFS)        Total area =       0.742(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      550.000 to Point/Station      551.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   626.500(Ft.)
Downstream point/station elevation =   623.000(Ft.)
Pipe length  =   115.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.112(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     3.112(CFS)
Normal flow depth in pipe =    6.01(In.)
Flow top width inside pipe =   12.00(In.)
Critical Depth =    9.07(In.)
Pipe flow velocity =      7.92(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =     7.92 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      551.000 to Point/Station      551.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     7.92 min.
Rainfall intensity =      6.852(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.509
Subarea runoff =      0.374(CFS) for      0.106(Ac.)
Total runoff =      3.487(CFS)        Total area =       0.848(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      551.000 to Point/Station      551.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.848(Ac.)
Runoff from this stream =      3.487(CFS)
Time of concentration =    7.92 min.
Rainfall intensity =     6.852(In/Hr)
Summary of stream data:

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


1        3.106      7.03               7.405
2        7.691      6.90               7.492
```

```
3        3.487      7.92               6.852
Qmax(1) =
          1.000 *    1.000 *     3.106) +
          0.988 *    1.000 *     7.691) +
          1.000 *    0.887 *     3.487) + =      13.799
Qmax(2) =
          1.000 *    0.982 *     3.106) +
          1.000 *    1.000 *     7.691) +
          1.000 *    0.871 *     3.487) + =      13.777
Qmax(3) =
          0.925 *    1.000 *     3.106) +
          0.915 *    1.000 *     7.691) +
          1.000 *    1.000 *     3.487) + =      13.395

Total of 3 streams to confluence:
Flow rates before confluence point:
       3.106       7.691       3.487
Maximum flow rates at confluence using above data:
       13.799       13.777       13.395
Area of streams before confluence:
        0.699        2.933        0.848
Results of confluence:
Total flow rate =     13.799(CFS)
Time of concentration =     7.026 min.
Effective stream area after confluence =      4.480(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      551.000 to Point/Station      552.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   619.000(Ft.)
Downstream point/station elevation =   618.000(Ft.)
Pipe length  =    20.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.799(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    13.799(CFS)
Normal flow depth in pipe =   11.74(In.)
Flow top width inside pipe =   12.37(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.40(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =     7.05 min.
End of computations, total study area =           4.480 (Ac.)
```

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                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2004 Version 7.4

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
        Rational Hydrology Study        Date: 02/15/13
----------------------------------------------------------------------
OUTFALL 6 - Las Posas Road: Node 536-559
POST DEVELOPMENT BEFORE DETENTION
100 Year Storm Event
File Name: 12052OUTFALL6
----------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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


Program License Serial Number 4012

----------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      536.000 to Point/Station      537.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   84.000(Ft.)
Highest elevation =  624.800(Ft.)
Lowest elevation =  621.700(Ft.)
Elevation difference =    3.100(Ft.) Slope =  3.690 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   3.69 %, in a development type of
 10.9 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =   6.40 minutes
 (for slope value of   3.00 %)
Rainfall intensity (I) =      7.864(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.415(CFS)
Total initial stream area =        0.088(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      537.000 to Point/Station      558.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   621.700(Ft.)
Downstream point/station elevation =   615.500(Ft.)
Pipe length  =   117.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.415(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.415(CFS)
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Normal flow depth in pipe =    2.34(In.)
Flow top width inside pipe =    5.85(In.)
Critical Depth =    3.93(In.)
Pipe flow velocity =      5.86(Ft/s)
Travel time through pipe =    0.33 min.
Time of concentration (TC) =     6.73 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      558.000 to Point/Station      558.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.73 min.
Rainfall intensity =      7.611(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.106
Subarea runoff =      0.393(CFS) for      0.089(Ac.)
Total runoff =      0.808(CFS)       Total area =       0.177(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      558.000 to Point/Station      558.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.177(Ac.)
Runoff from this stream =      0.808(CFS)
Time of concentration =    6.73 min.
Rainfall intensity =     7.611(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      557.000 to Point/Station      558.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  690.000(Ft.)
Highest elevation =  737.000(Ft.)
Lowest elevation =  615.500(Ft.)
Elevation difference =  121.500(Ft.) Slope = 17.609 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  17.61 %, in a development type of
 Permanent Open Space
In Accordance With Table 3-2
Initial Area Time of Concentration =   6.90 minutes
 (for slope value of  10.00 %)
Rainfall intensity (I) =      7.492(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =     10.814(CFS)
Total initial stream area =        4.124(Ac.)


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Process from Point/Station      558.000 to Point/Station      558.000
**** CONFLUENCE OF MINOR STREAMS ****
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____________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      4.124(Ac.)
Runoff from this stream =     10.814(CFS)
Time of concentration =    6.90 min.
Rainfall intensity =     7.492(In/Hr)
Summary of stream data:

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


1        0.808      6.73               7.611
2       10.814      6.90               7.492
Qmax(1) =
           1.000 *    1.000 *     0.808) +
           1.000 *    0.976 *    10.814) + =      11.360
Qmax(2) =
           0.984 *    1.000 *     0.808) +
           1.000 *    1.000 *    10.814) + =      11.609

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.808      10.814
Maximum flow rates at confluence using above data:
       11.360       11.609
Area of streams before confluence:
        0.177        4.124
Results of confluence:
Total flow rate =     11.609(CFS)
Time of concentration =     6.900 min.
Effective stream area after confluence =      4.301(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      558.000 to Point/Station      555.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________
Upstream point/station elevation =   615.500(Ft.)
Downstream point/station elevation =   614.000(Ft.)
Pipe length  =    70.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.609(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    11.609(CFS)
Normal flow depth in pipe =   11.68(In.)
Flow top width inside pipe =   17.18(In.)
Critical Depth =   15.57(In.)
Pipe flow velocity =      9.56(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =     7.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      555.000 to Point/Station      555.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      4.301(Ac.)
Runoff from this stream =     11.609(CFS)
Time of concentration =    7.02 min.
Rainfall intensity =     7.408(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      551.000 to Point/Station      553.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
```

```
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   86.000(Ft.)
Highest elevation =  627.500(Ft.)
Lowest elevation =  624.000(Ft.)
Elevation difference =    3.500(Ft.) Slope =  4.070 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   4.07 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.64 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*( 100.000^.5)/(   4.070^(1/3)]=   5.64
Rainfall intensity (I) =      8.535(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.553(CFS)
Total initial stream area =        0.108(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      553.000 to Point/Station      554.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   619.500(Ft.)
Downstream point/station elevation =   616.500(Ft.)
Pipe length  =    90.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.553(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.553(CFS)
Normal flow depth in pipe =    3.14(In.)
Flow top width inside pipe =    5.99(In.)
Critical Depth =    4.55(In.)
Pipe flow velocity =      5.32(Ft/s)
Travel time through pipe =    0.28 min.
Time of concentration (TC) =     5.92 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      554.000 to Point/Station      554.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     5.92 min.
Rainfall intensity =      8.271(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.130
Subarea runoff =      0.519(CFS) for      0.108(Ac.)
Total runoff =      1.072(CFS)       Total area =       0.216(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      554.000 to Point/Station      555.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   616.500(Ft.)
Downstream point/station elevation =   614.000(Ft.)
Pipe length  =   121.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.072(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.072(CFS)
Normal flow depth in pipe =    4.24(In.)
```

```
Flow top width inside pipe =    8.98(In.)
Critical Depth =    5.70(In.)
Pipe flow velocity =      5.24(Ft/s)
Travel time through pipe =    0.38 min.
Time of concentration (TC) =     6.30 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      555.000 to Point/Station      555.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.30 min.
Rainfall intensity =      7.941(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.193
Subarea runoff =      0.462(CFS) for      0.106(Ac.)
Total runoff =      1.534(CFS)        Total area =       0.322(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      555.000 to Point/Station      555.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.322(Ac.)
Runoff from this stream =      1.534(CFS)
Time of concentration =    6.30 min.
Rainfall intensity =     7.941(In/Hr)
Summary of stream data:

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


1       11.609      7.02               7.408
2        1.534      6.30               7.941
Qmax(1) =
          1.000 *    1.000 *    11.609) +
          0.933 *    1.000 *     1.534) + =      13.040
Qmax(2) =
          1.000 *    0.898 *    11.609) +
          1.000 *    1.000 *     1.534) + =      11.956

Total of 2 streams to confluence:
Flow rates before confluence point:
      11.609       1.534
Maximum flow rates at confluence using above data:
       13.040       11.956
Area of streams before confluence:
        4.301        0.322
Results of confluence:
Total flow rate =     13.040(CFS)
Time of concentration =     7.022 min.
Effective stream area after confluence =      4.623(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      555.000 to Point/Station      559.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   614.000(Ft.)
Downstream point/station elevation =   610.000(Ft.)
Pipe length  =    32.00(Ft.)   Manning's N = 0.013
```

```
No. of pipes = 1  Required pipe flow  =    13.040(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    13.040(CFS)
Normal flow depth in pipe =    8.12(In.)
Flow top width inside pipe =   14.95(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.22(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     7.05 min.
End of computations, total study area =           4.623 (Ac.)
```

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2004 Version 7.4

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
        Rational Hydrology Study        Date: 02/18/13
------------------------------------------------------------------------
OUTFALL 7 - Las Posas Road: Node 400-434
POST DEVELOPMENT BEFORE DETENTION
100 Year Storm Event
File Name: 12052SESTA
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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


Program License Serial Number 4012

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      400.000 to Point/Station      401.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation = 1038.000(Ft.)
Lowest elevation = 1027.000(Ft.)
Elevation difference =   11.000(Ft.) Slope = 11.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  11.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.07 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(  11.000^(1/3)]=   6.07
Rainfall intensity (I) =      8.137(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      0.208(CFS)
Total initial stream area =        0.073(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      401.000 to Point/Station      402.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      9.193(CFS)
Depth of flow =   0.479(Ft.), Average velocity =   6.691(Ft/s)
        ******* Irregular Channel Data ***********
-------------------------------------------------------------
Information entered for subchannel number 1 :
```

```
Point number      'X' coordinate     'Y' coordinate
        1              0.00              5.00
        2             30.00              0.00
        3             60.00              5.00
Manning's 'N' friction factor =   0.045
----------------------------------------------------------------
Sub-Channel flow  =      9.193(CFS)
  '     '       flow top width =      5.742(Ft.)
  '     '    velocity=    6.691(Ft/s)
  '     '       area =      1.374(Sq.Ft)
  '     '       Froude number =     2.410

Upstream point elevation =  1027.000(Ft.)
Downstream point elevation =   857.000(Ft.)
Flow length =   604.000(Ft.)
Travel time  =    1.50 min.
Time of concentration =    7.57 min.
Depth of flow =   0.479(Ft.)
Average velocity =   6.691(Ft/s)
Total irregular channel flow =     9.193(CFS)
Irregular channel normal depth above invert elev. =   0.479(Ft.)
Average velocity of channel(s) =   6.691(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      7.054(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      2.563
Subarea runoff =     17.872(CFS) for      7.250(Ac.)
Total runoff =     18.080(CFS)       Total area =       7.323(Ac.)
Depth of flow =   0.617(Ft.), Average velocity =   7.923(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      402.000 to Point/Station      403.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Depth of flow =   0.874(Ft.), Average velocity =  18.944(Ft/s)
        ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.00
        2              1.25              0.00
        3              2.50              1.00
Manning's 'N' friction factor =   0.013
----------------------------------------------------------------
Sub-Channel flow  =     18.080(CFS)
  '     '       flow top width =      2.185(Ft.)
  '     '    velocity=   18.944(Ft/s)
  '     '       area =      0.954(Sq.Ft)
  '     '       Froude number =     5.051

Upstream point elevation =   857.000(Ft.)
Downstream point elevation =   779.000(Ft.)
Flow length =   677.000(Ft.)
Travel time  =    0.60 min.
Time of concentration =    8.17 min.
Depth of flow =   0.874(Ft.)
Average velocity =  18.944(Ft/s)
Total irregular channel flow =    18.080(CFS)
Irregular channel normal depth above invert elev. =   0.874(Ft.)
Average velocity of channel(s) =  18.944(Ft/s)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      403.000 to Point/Station      404.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   774.000(Ft.)
Downstream point/station elevation =   746.000(Ft.)
Pipe length  =   200.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    18.080(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    18.080(CFS)
Normal flow depth in pipe =    9.68(In.)
Flow top width inside pipe =   14.35(In.)
Critical depth could not be calculated.
Pipe flow velocity =     21.61(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =     8.32 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      404.000 to Point/Station      404.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      7.323(Ac.)
Runoff from this stream =     18.080(CFS)
Time of concentration =    8.32 min.
Rainfall intensity =     6.637(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      405.000 to Point/Station      406.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =   99.000(Ft.)
Highest elevation =  837.000(Ft.)
Lowest elevation =  809.000(Ft.)
Elevation difference =   28.000(Ft.) Slope = 28.283 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  28.28 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.43 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(  28.283^(1/3)]=   4.43
Rainfall intensity (I) =      9.969(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      0.349(CFS)
Total initial stream area =        0.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      406.000 to Point/Station      407.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.869(CFS)
Depth of flow =   0.139(Ft.), Average velocity =   2.996(Ft/s)
        ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              2.00
        2             30.00              0.00
```

```
        3             60.00              2.00
Manning's 'N' friction factor =   0.045
----------------------------------------------------------------
Sub-Channel flow  =      0.869(CFS)
  '     '       flow top width =      4.171(Ft.)
  '     '    velocity=    2.997(Ft/s)
  '     '       area =      0.290(Sq.Ft)
  '     '       Froude number =     2.003

Upstream point elevation =   809.000(Ft.)
Downstream point elevation =   770.000(Ft.)
Flow length =   135.000(Ft.)
Travel time  =    0.75 min.
Time of concentration =    5.18 min.
Depth of flow =   0.139(Ft.)
Average velocity =   2.996(Ft/s)
Total irregular channel flow =     0.869(CFS)
Irregular channel normal depth above invert elev. =   0.139(Ft.)
Average velocity of channel(s) =   2.996(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      9.012(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      0.146
Subarea runoff =      0.969(CFS) for      0.318(Ac.)
Total runoff =      1.318(CFS)       Total area =       0.418(Ac.)
Depth of flow =   0.163(Ft.), Average velocity =   3.326(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      407.000 to Point/Station      408.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Depth of flow =   0.394(Ft.), Average velocity =   6.794(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              1.00
       2              1.25              0.00
       3              2.50              1.00
Manning's 'N' friction factor =   0.013
----------------------------------------------------------------
Sub-Channel flow  =      1.318(CFS)
  '     '       flow top width =      0.985(Ft.)
  '     '    velocity=    6.794(Ft/s)
  '     '       area =      0.194(Sq.Ft)
  '     '       Froude number =     2.697

Upstream point elevation =   770.000(Ft.)
Downstream point elevation =   765.500(Ft.)
Flow length =   105.000(Ft.)
Travel time  =    0.26 min.
Time of concentration =    5.44 min.
Depth of flow =   0.394(Ft.)
Average velocity =   6.794(Ft/s)
Total irregular channel flow =     1.318(CFS)
Irregular channel normal depth above invert elev. =   0.394(Ft.)
Average velocity of channel(s) =   6.794(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      408.000 to Point/Station      404.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
```

```
Upstream point/station elevation =   764.500(Ft.)
Downstream point/station elevation =   746.000(Ft.)
Pipe length  =    15.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.318(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.318(CFS)
Normal flow depth in pipe =    1.87(In.)
Flow top width inside pipe =    5.56(In.)
Critical depth could not be calculated.
Pipe flow velocity =     25.18(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =     5.45 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      404.000 to Point/Station      404.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.418(Ac.)
Runoff from this stream =      1.318(CFS)
Time of concentration =    5.45 min.
Rainfall intensity =     8.724(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      409.000 to Point/Station      410.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  194.000(Ft.)
Highest elevation =  835.000(Ft.)
Lowest elevation =  777.000(Ft.)
Elevation difference =   58.000(Ft.) Slope = 29.897 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  29.90 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.35 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(  29.897^(1/3)]=   4.35
Rainfall intensity (I) =     10.089(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      0.876(CFS)
Total initial stream area =        0.248(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      410.000 to Point/Station      404.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   764.000(Ft.)
Downstream point/station elevation =   746.000(Ft.)
Pipe length  =    63.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.876(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.876(CFS)
Normal flow depth in pipe =    2.22(In.)
Flow top width inside pipe =    5.79(In.)
Critical Depth =    5.49(In.)
Pipe flow velocity =     13.25(Ft/s)
Travel time through pipe =    0.08 min.
```

```
Time of concentration (TC) =     4.43 min.


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Process from Point/Station      404.000 to Point/Station      404.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.248(Ac.)
Runoff from this stream =      0.876(CFS)
Time of concentration =    4.43 min.
Rainfall intensity =     9.972(In/Hr)
Summary of stream data:

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


1       18.080      8.32               6.637
2        1.318      5.45               8.724
3        0.876      4.43               9.972
Qmax(1) =
          1.000 *    1.000 *    18.080) +
          0.761 *    1.000 *     1.318) +
          0.666 *    1.000 *     0.876) + =      19.666
Qmax(2) =
          1.000 *    0.655 *    18.080) +
          1.000 *    1.000 *     1.318) +
          0.875 *    1.000 *     0.876) + =      13.920
Qmax(3) =
          1.000 *    0.532 *    18.080) +
          1.000 *    0.813 *     1.318) +
          1.000 *    1.000 *     0.876) + =      11.566

Total of 3 streams to confluence:
Flow rates before confluence point:
      18.080       1.318       0.876
Maximum flow rates at confluence using above data:
       19.666       13.920       11.566
Area of streams before confluence:
        7.323        0.418        0.248
Results of confluence:
Total flow rate =     19.666(CFS)
Time of concentration =     8.325 min.
Effective stream area after confluence =      7.989(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      404.000 to Point/Station      411.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   746.000(Ft.)
Downstream point/station elevation =   744.000(Ft.)
Pipe length  =    77.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    19.666(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    19.666(CFS)
Normal flow depth in pipe =   13.83(In.)
Flow top width inside pipe =   19.92(In.)
Critical Depth =   19.08(In.)
Pipe flow velocity =     11.71(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =     8.43 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      411.000 to Point/Station      411.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
```

```
Stream flow area =      7.989(Ac.)
Runoff from this stream =     19.666(CFS)
Time of concentration =    8.43 min.
Rainfall intensity =     6.582(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      412.000 to Point/Station      413.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  255.000(Ft.)
Highest elevation =  853.000(Ft.)
Lowest elevation =  847.000(Ft.)
Elevation difference =    6.000(Ft.) Slope =  2.353 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 80.00 (Ft)
for the top area slope value of   2.35 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.05 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  80.000^.5)/(   2.353^(1/3)]=   6.05
Rainfall intensity (I) =      8.153(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      1.653(CFS)
Total initial stream area =        0.338(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      413.000 to Point/Station      414.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      3.351(CFS)
Depth of flow =   0.151(Ft.), Average velocity =   7.181(Ft/s)
       ******* Irregular Channel Data ***********
--------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             20.00              0.00
       3             20.50              0.50
Manning's 'N' friction factor =   0.013
--------------------------------------------------------------
Sub-Channel flow  =      3.351(CFS)
  '     '       flow top width =      6.186(Ft.)
  '     '    velocity=    7.181(Ft/s)
  '     '       area =      0.467(Sq.Ft)
  '     '       Froude number =     4.607

Upstream point elevation =   847.000(Ft.)
Downstream point elevation =   759.000(Ft.)
Flow length =   701.000(Ft.)
Travel time  =    1.63 min.
Time of concentration =    7.68 min.
Depth of flow =   0.151(Ft.)
Average velocity =   7.181(Ft/s)
Total irregular channel flow =     3.351(CFS)
Irregular channel normal depth above invert elev. =   0.151(Ft.)
Average velocity of channel(s) =   7.181(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
```

```
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity =      6.992(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.714
Subarea runoff =      3.339(CFS) for      0.852(Ac.)
Total runoff =      4.992(CFS)       Total area =       1.190(Ac.)
Depth of flow =   0.175(Ft.), Average velocity =   7.933(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      414.000 to Point/Station      414.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.190(Ac.)
Runoff from this stream =      4.992(CFS)
Time of concentration =    7.68 min.
Rainfall intensity =     6.992(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      415.000 to Point/Station      416.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  225.000(Ft.)
Highest elevation =  853.000(Ft.)
Lowest elevation =  847.200(Ft.)
Elevation difference =    5.800(Ft.) Slope =  2.578 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   2.58 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.23 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  90.000^.5)/(   2.578^(1/3)]=   6.23
Rainfall intensity (I) =      8.005(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      1.374(CFS)
Total initial stream area =        0.286(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      416.000 to Point/Station      417.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.602(CFS)
Depth of flow =   0.138(Ft.), Average velocity =   6.641(Ft/s)
       ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             20.00              0.00
       3             20.50              0.50
Manning's 'N' friction factor =   0.013
-----------------------------------------------------------------
Sub-Channel flow  =      2.602(CFS)
```

```
  '     '       flow top width =      5.668(Ft.)
  '     '    velocity=    6.641(Ft/s)
  '     '       area =      0.392(Sq.Ft)
  '     '       Froude number =     4.452

Upstream point elevation =   847.200(Ft.)
Downstream point elevation =   759.000(Ft.)
Flow length =   731.000(Ft.)
Travel time  =    1.83 min.
Time of concentration =    8.06 min.
Depth of flow =   0.138(Ft.)
Average velocity =   6.641(Ft/s)
Total irregular channel flow =     2.602(CFS)
Irregular channel normal depth above invert elev. =   0.138(Ft.)
Average velocity of channel(s) =   6.641(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity =      6.777(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.552
Subarea runoff =      2.367(CFS) for      0.634(Ac.)
Total runoff =      3.741(CFS)       Total area =       0.920(Ac.)
Depth of flow =   0.158(Ft.), Average velocity =   7.272(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      417.000 to Point/Station      414.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   755.500(Ft.)
Downstream point/station elevation =   755.000(Ft.)
Pipe length  =    33.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.741(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     3.741(CFS)
Normal flow depth in pipe =    8.52(In.)
Flow top width inside pipe =   10.89(In.)
Critical Depth =    9.88(In.)
Pipe flow velocity =      6.27(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =     8.15 min.


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Process from Point/Station      414.000 to Point/Station      414.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.920(Ac.)
Runoff from this stream =      3.741(CFS)
Time of concentration =    8.15 min.
Rainfall intensity =     6.729(In/Hr)
Summary of stream data:

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


1        4.992      7.68               6.992
2        3.741      8.15               6.729
Qmax(1) =
          1.000 *    1.000 *     4.992) +
          1.000 *    0.942 *     3.741) + =       8.517
Qmax(2) =
```

```
          0.962 *    1.000 *     4.992) +
          1.000 *    1.000 *     3.741) + =       8.545

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.992       3.741
Maximum flow rates at confluence using above data:
        8.517        8.545
Area of streams before confluence:
        1.190        0.920
Results of confluence:
Total flow rate =      8.545(CFS)
Time of concentration =     8.149 min.
Effective stream area after confluence =      2.110(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      414.000 to Point/Station      418.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   755.000(Ft.)
Downstream point/station elevation =   750.500(Ft.)
Pipe length  =    24.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.545(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     8.545(CFS)
Normal flow depth in pipe =    6.38(In.)
Flow top width inside pipe =   11.98(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.14(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =     8.17 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      418.000 to Point/Station      419.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      8.676(CFS)
Depth of flow =   0.121(Ft.), Average velocity =   1.322(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              2.00
       2              4.00              0.00
       3             58.00              0.00
       4             62.00              2.00
Manning's 'N' friction factor =   0.030
----------------------------------------------------------------
Sub-Channel flow  =      8.676(CFS)
  '     '       flow top width =     54.484(Ft.)
  '     '    velocity=    1.322(Ft/s)
  '     '       area =      6.561(Sq.Ft)
  '     '       Froude number =     0.671

Upstream point elevation =   750.500(Ft.)
Downstream point elevation =   750.200(Ft.)
Flow length =    25.000(Ft.)
Travel time  =    0.32 min.
Time of concentration =    8.48 min.
Depth of flow =   0.121(Ft.)
Average velocity =   1.322(Ft/s)
Total irregular channel flow =     8.676(CFS)
Irregular channel normal depth above invert elev. =   0.121(Ft.)
Average velocity of channel(s) =   1.322(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
```

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[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity =      6.557(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      1.333
Subarea runoff =      0.196(CFS) for      0.112(Ac.)
Total runoff =      8.742(CFS)        Total area =       2.222(Ac.)
Depth of flow =   0.122(Ft.), Average velocity =   1.326(Ft/s)


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Process from Point/Station      419.000 to Point/Station      411.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   746.200(Ft.)
Downstream point/station elevation =   744.000(Ft.)
Pipe length  =    85.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.742(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     8.742(CFS)
Normal flow depth in pipe =   10.54(In.)
Flow top width inside pipe =   13.72(In.)
Critical Depth =   13.75(In.)
Pipe flow velocity =      9.49(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =     8.63 min.


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Process from Point/Station      411.000 to Point/Station      411.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.222(Ac.)
Runoff from this stream =      8.742(CFS)
Time of concentration =    8.63 min.
Rainfall intensity =     6.483(In/Hr)
Summary of stream data:

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


1       19.666      8.43               6.582
2        8.742      8.63               6.483
Qmax(1) =
          1.000 *    1.000 *    19.666) +
          1.000 *    0.977 *     8.742) + =      28.206
Qmax(2) =
          0.985 *    1.000 *    19.666) +
          1.000 *    1.000 *     8.742) + =      28.114

Total of 2 main streams to confluence:
Flow rates before confluence point:
      19.666       8.742
Maximum flow rates at confluence using above data:
       28.206       28.114
Area of streams before confluence:
        7.989        2.222


Results of confluence:
Total flow rate =     28.206(CFS)
Time of concentration =     8.434 min.
Effective stream area after confluence  =     10.211(Ac.)


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Process from Point/Station      411.000 to Point/Station      420.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   744.000(Ft.)
Downstream point/station elevation =   698.500(Ft.)
Pipe length  =   424.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    28.206(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    28.206(CFS)
Normal flow depth in pipe =   12.40(In.)
Flow top width inside pipe =   16.67(In.)
Critical depth could not be calculated.
Pipe flow velocity =     21.73(Ft/s)
Travel time through pipe =    0.33 min.
Time of concentration (TC) =     8.76 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      420.000 to Point/Station      420.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     10.211(Ac.)
Runoff from this stream =     28.206(CFS)
Time of concentration =    8.76 min.
Rainfall intensity =     6.423(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      421.000 to Point/Station      422.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   52.000(Ft.)
Highest elevation =  710.800(Ft.)
Lowest elevation =  710.400(Ft.)
Elevation difference =    0.400(Ft.) Slope =  0.769 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 65.00 (Ft)
for the top area slope value of   0.77 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.92 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  65.000^.5)/(   0.769^(1/3)]=   7.92
Rainfall intensity (I) =      6.854(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.197(CFS)
Total initial stream area =        0.048(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      422.000 to Point/Station      423.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.391(CFS)
Depth of flow =   0.085(Ft.), Average velocity =   2.169(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              0.80
```

```
        2             20.00              0.00
        3             40.00              0.80
Manning's 'N' friction factor =   0.013
----------------------------------------------------------------
Sub-Channel flow  =      0.391(CFS)
  '     '       flow top width =      4.244(Ft.)
  '     '    velocity=    2.169(Ft/s)
  '     '       area =      0.180(Sq.Ft)
  '     '       Froude number =     1.856

Upstream point elevation =   710.400(Ft.)
Downstream point elevation =   708.500(Ft.)
Flow length =    78.000(Ft.)
Travel time  =    0.60 min.
Time of concentration =    8.52 min.
Depth of flow =   0.085(Ft.)
Average velocity =   2.169(Ft/s)
Total irregular channel flow =     0.391(CFS)
Irregular channel normal depth above invert elev. =   0.085(Ft.)
Average velocity of channel(s) =   2.169(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity =      6.539(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.085
Subarea runoff =      0.360(CFS) for      0.094(Ac.)
Total runoff =      0.557(CFS)        Total area =       0.142(Ac.)
Depth of flow =   0.097(Ft.), Average velocity =   2.371(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      423.000 to Point/Station      423.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      0.142(Ac.)
Runoff from this stream =      0.557(CFS)
Time of concentration =    8.52 min.
Rainfall intensity =     6.539(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      424.000 to Point/Station      425.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   65.000(Ft.)
Highest elevation =  711.400(Ft.)
Lowest elevation =  710.400(Ft.)
Elevation difference =    1.000(Ft.) Slope =  1.538 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 80.00 (Ft)
for the top area slope value of   1.54 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.97 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
```

```
TC = [1.8*(1.1-0.6000)*(  80.000^.5)/(   1.538^(1/3)]=   6.97
Rainfall intensity (I) =      7.441(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.254(CFS)
Total initial stream area =        0.057(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      425.000 to Point/Station      426.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.446(CFS)
Depth of flow =   0.093(Ft.), Average velocity =   2.083(Ft/s)
       ******* Irregular Channel Data ***********
--------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.80
       2             20.00              0.00
       3             40.00              0.80
Manning's 'N' friction factor =   0.013
--------------------------------------------------------------
Sub-Channel flow  =      0.446(CFS)
  '     '       flow top width =      4.629(Ft.)
  '     '    velocity=    2.083(Ft/s)
  '     '       area =      0.214(Sq.Ft)
  '     '       Froude number =     1.706

Upstream point elevation =   710.400(Ft.)
Downstream point elevation =   708.500(Ft.)
Flow length =    95.000(Ft.)
Travel time  =    0.76 min.
Time of concentration =    7.73 min.
Depth of flow =   0.093(Ft.)
Average velocity =   2.083(Ft/s)
Total irregular channel flow =     0.446(CFS)
Irregular channel normal depth above invert elev. =   0.093(Ft.)
Average velocity of channel(s) =   2.083(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity =      6.960(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.086
Subarea runoff =      0.343(CFS) for      0.086(Ac.)
Total runoff =      0.597(CFS)       Total area =       0.143(Ac.)
Depth of flow =   0.103(Ft.), Average velocity =   2.240(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      426.000 to Point/Station      423.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   706.000(Ft.)
Downstream point/station elevation =   705.500(Ft.)
Pipe length  =    54.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.597(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.597(CFS)
Normal flow depth in pipe =    3.82(In.)
Flow top width inside pipe =    8.90(In.)
Critical Depth =    4.20(In.)
Pipe flow velocity =      3.35(Ft/s)
Travel time through pipe =    0.27 min.
Time of concentration (TC) =     8.00 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      423.000 to Point/Station      423.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.143(Ac.)
Runoff from this stream =      0.597(CFS)
Time of concentration =    8.00 min.
Rainfall intensity =     6.808(In/Hr)
Summary of stream data:

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


1        0.557      8.52               6.539
2        0.597      8.00               6.808
Qmax(1) =
          1.000 *    1.000 *     0.557) +
          0.960 *    1.000 *     0.597) + =       1.131
Qmax(2) =
          1.000 *    0.939 *     0.557) +
          1.000 *    1.000 *     0.597) + =       1.121

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.557       0.597
Maximum flow rates at confluence using above data:
        1.131        1.121
Area of streams before confluence:
        0.142        0.143
Results of confluence:
Total flow rate =      1.131(CFS)
Time of concentration =     8.519 min.
Effective stream area after confluence =      0.285(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      423.000 to Point/Station      427.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   705.500(Ft.)
Downstream point/station elevation =   705.300(Ft.)
Pipe length  =    16.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.131(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.131(CFS)
Normal flow depth in pipe =    5.09(In.)
Flow top width inside pipe =    8.92(In.)
Critical Depth =    5.87(In.)
Pipe flow velocity =      4.40(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     8.58 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      427.000 to Point/Station      428.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.210(CFS)
Depth of flow =   0.057(Ft.), Average velocity =   0.966(Ft/s)
       ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              6.50
       2             13.00              0.00
       3             35.00              0.00
       4             40.00              2.50
```

```
Manning's 'N' friction factor =   0.030
----------------------------------------------------------------
Sub-Channel flow  =      1.210(CFS)
  '     '       flow top width =     22.227(Ft.)
  '     '    velocity=    0.966(Ft/s)
  '     '       area =      1.252(Sq.Ft)
  '     '       Froude number =     0.717

Upstream point elevation =   705.300(Ft.)
Downstream point elevation =   705.000(Ft.)
Flow length =    17.000(Ft.)
Travel time  =    0.29 min.
Time of concentration =    8.87 min.
Depth of flow =   0.057(Ft.)
Average velocity =   0.966(Ft/s)
Total irregular channel flow =     1.210(CFS)
Irregular channel normal depth above invert elev. =   0.057(Ft.)
Average velocity of channel(s) =   0.966(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity =      6.370(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.195
Subarea runoff =      0.111(CFS) for      0.040(Ac.)
Total runoff =      1.242(CFS)        Total area =       0.325(Ac.)
Depth of flow =   0.058(Ft.), Average velocity =   0.976(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      428.000 to Point/Station      420.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   701.000(Ft.)
Downstream point/station elevation =   698.500(Ft.)
Pipe length  =   130.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.242(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.242(CFS)
Normal flow depth in pipe =    4.72(In.)
Flow top width inside pipe =    8.99(In.)
Critical Depth =    6.15(In.)
Pipe flow velocity =      5.30(Ft/s)
Travel time through pipe =    0.41 min.
Time of concentration (TC) =     9.28 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      420.000 to Point/Station      420.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.325(Ac.)
Runoff from this stream =      1.242(CFS)
Time of concentration =    9.28 min.
Rainfall intensity =     6.187(In/Hr)
Summary of stream data:

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


1       28.206      8.76               6.423
2        1.242      9.28               6.187
```

```
Qmax(1) =
          1.000 *    1.000 *    28.206) +
          1.000 *    0.944 *     1.242) + =      29.378
Qmax(2) =
          0.963 *    1.000 *    28.206) +
          1.000 *    1.000 *     1.242) + =      28.413

Total of 2 main streams to confluence:
Flow rates before confluence point:
      28.206       1.242
Maximum flow rates at confluence using above data:
       29.378       28.413
Area of streams before confluence:
       10.211        0.325


Results of confluence:
Total flow rate =     29.378(CFS)
Time of concentration =     8.759 min.
Effective stream area after confluence  =     10.536(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      420.000 to Point/Station      429.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   698.500(Ft.)
Downstream point/station elevation =   642.300(Ft.)
Pipe length  =   365.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    29.378(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    29.378(CFS)
Normal flow depth in pipe =   11.23(In.)
Flow top width inside pipe =   17.44(In.)
Critical depth could not be calculated.
Pipe flow velocity =     25.33(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =     9.00 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      429.000 to Point/Station      430.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   642.300(Ft.)
Downstream point/station elevation =   641.300(Ft.)
Pipe length  =    47.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    29.378(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    29.378(CFS)
Normal flow depth in pipe =   17.65(In.)
Flow top width inside pipe =   21.17(In.)
Critical Depth =   22.22(In.)
Pipe flow velocity =     11.87(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =     9.07 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      430.000 to Point/Station      430.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     10.536(Ac.)
Runoff from this stream =     29.378(CFS)
Time of concentration =    9.07 min.
Rainfall intensity =     6.282(In/Hr)
Program is now starting with Main Stream No. 2
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      431.000 to Point/Station      432.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   99.000(Ft.)
Highest elevation =  765.000(Ft.)
Lowest elevation =  752.500(Ft.)
Elevation difference =   12.500(Ft.) Slope = 12.626 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  12.63 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.87 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*( 100.000^.5)/(  12.626^(1/3)]=   3.87
Rainfall intensity (I) =     10.887(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.261(CFS)
Total initial stream area =        0.040(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      432.000 to Point/Station      433.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.147(CFS)
Depth of flow =   0.134(Ft.), Average velocity =   5.875(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             20.00              0.00
       3             20.50              0.50
Manning's 'N' friction factor =   0.013
----------------------------------------------------------------
Sub-Channel flow  =      2.147(CFS)
  '     '       flow top width =      5.475(Ft.)
  '     '    velocity=    5.875(Ft/s)
  '     '       area =      0.365(Sq.Ft)
  '     '       Froude number =     4.007

Upstream point elevation =   752.500(Ft.)
Downstream point elevation =   663.800(Ft.)
Flow length =   897.000(Ft.)
Travel time  =    2.54 min.
Time of concentration =    6.41 min.
Depth of flow =   0.134(Ft.)
Average velocity =   5.875(Ft/s)
Total irregular channel flow =     2.147(CFS)
Irregular channel normal depth above invert elev. =   0.134(Ft.)
Average velocity of channel(s) =   5.875(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity =      7.856(In/Hr) for a   100.0 year storm
```

```
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.506
Subarea runoff =      3.712(CFS) for      0.803(Ac.)
Total runoff =      3.974(CFS)       Total area =       0.843(Ac.)
Depth of flow =   0.168(Ft.), Average velocity =   6.852(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      433.000 to Point/Station      434.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   659.800(Ft.)
Downstream point/station elevation =   659.000(Ft.)
Pipe length  =     3.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.974(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     3.974(CFS)
Normal flow depth in pipe =    4.31(In.)
Flow top width inside pipe =    8.99(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.98(Ft/s)
Travel time through pipe =    0.00 min.
Time of concentration (TC) =     6.41 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      434.000 to Point/Station      434.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      0.843(Ac.)
Runoff from this stream =      3.974(CFS)
Time of concentration =    6.41 min.
Rainfall intensity =     7.854(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      431.000 to Point/Station      435.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   95.000(Ft.)
Highest elevation =  765.000(Ft.)
Lowest elevation =  752.500(Ft.)
Elevation difference =   12.500(Ft.) Slope = 13.158 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  13.16 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.81 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*( 100.000^.5)/(  13.158^(1/3)]=   3.81
Rainfall intensity (I) =     10.985(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.250(CFS)
Total initial stream area =        0.038(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      435.000 to Point/Station      436.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.611(CFS)
```

```
Depth of flow =   0.143(Ft.), Average velocity =   6.235(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             20.00              0.00
       3             20.50              0.50
Manning's 'N' friction factor =   0.013
----------------------------------------------------------------
Sub-Channel flow  =      2.611(CFS)
  '     '       flow top width =      5.860(Ft.)
  '     '    velocity=    6.235(Ft/s)
  '     '       area =      0.419(Sq.Ft)
  '     '       Froude number =     4.110

Upstream point elevation =   752.500(Ft.)
Downstream point elevation =   663.800(Ft.)
Flow length =   872.000(Ft.)
Travel time  =    2.33 min.
Time of concentration =    6.14 min.
Depth of flow =   0.143(Ft.)
Average velocity =   6.235(Ft/s)
Total irregular channel flow =     2.611(CFS)
Irregular channel normal depth above invert elev. =   0.143(Ft.)
Average velocity of channel(s) =   6.235(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity =      8.075(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.607
Subarea runoff =      4.652(CFS) for      0.974(Ac.)
Total runoff =      4.903(CFS)       Total area =       1.012(Ac.)
Depth of flow =   0.181(Ft.), Average velocity =   7.299(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      436.000 to Point/Station      434.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   659.800(Ft.)
Downstream point/station elevation =   659.000(Ft.)
Pipe length  =    33.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.903(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     4.903(CFS)
Normal flow depth in pipe =    8.77(In.)
Flow top width inside pipe =   10.65(In.)
Critical Depth =   10.94(In.)
Pipe flow velocity =      7.97(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =     6.21 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      434.000 to Point/Station      434.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.012(Ac.)
Runoff from this stream =      4.903(CFS)
Time of concentration =    6.21 min.
Rainfall intensity =     8.017(In/Hr)
Summary of stream data:
```

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


1        3.974      6.41               7.854
2        4.903      6.21               8.017
Qmax(1) =
          1.000 *    1.000 *     3.974) +
          0.980 *    1.000 *     4.903) + =       8.777
Qmax(2) =
          1.000 *    0.969 *     3.974) +
          1.000 *    1.000 *     4.903) + =       8.753

Total of 2 streams to confluence:
Flow rates before confluence point:
       3.974       4.903
Maximum flow rates at confluence using above data:
        8.777        8.753
Area of streams before confluence:
        0.843        1.012
Results of confluence:
Total flow rate =      8.777(CFS)
Time of concentration =     6.412 min.
Effective stream area after confluence =      1.855(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      434.000 to Point/Station      430.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   659.000(Ft.)
Downstream point/station elevation =   641.300(Ft.)
Pipe length  =    65.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.777(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     8.777(CFS)
Normal flow depth in pipe =    5.80(In.)
Flow top width inside pipe =   11.99(In.)
Critical depth could not be calculated.
Pipe flow velocity =     23.33(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =     6.46 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      430.000 to Point/Station      430.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.855(Ac.)
Runoff from this stream =      8.777(CFS)
Time of concentration =    6.46 min.
Rainfall intensity =     7.818(In/Hr)
Summary of stream data:

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


1       29.378      9.07               6.282
2        8.777      6.46               7.818
Qmax(1) =
          1.000 *    1.000 *    29.378) +
          0.804 *    1.000 *     8.777) + =      36.432
Qmax(2) =
          1.000 *    0.712 *    29.378) +
          1.000 *    1.000 *     8.777) + =      29.708

Total of 2 main streams to confluence:
```

```
Flow rates before confluence point:
      29.378       8.777
Maximum flow rates at confluence using above data:
       36.432       29.708
Area of streams before confluence:
       10.536        1.855


Results of confluence:
Total flow rate =     36.432(CFS)
Time of concentration =     9.066 min.
Effective stream area after confluence  =     12.391(Ac.)
End of computations, total study area =          12.391 (Ac.)
```

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2004 Version 7.4

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
        Rational Hydrology Study        Date: 02/18/13
----------------------------------------------------------------------
OUTFALL 8 - Las Posas Road: Node 600-648
POST DEVELOPMENT BEFORE DETENTION
100 Year Storm Event
File Name: 12052WQG
----------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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


Program License Serial Number 4012

----------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      600.000 to Point/Station      601.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   96.000(Ft.)
Highest elevation =  853.000(Ft.)
Lowest elevation =  852.000(Ft.)
Elevation difference =    1.000(Ft.) Slope =  1.042 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 65.00 (Ft)
for the top area slope value of   1.04 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.16 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  65.000^.5)/(   1.042^(1/3)]=   7.16
Rainfall intensity (I) =      7.317(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.847(CFS)
Total initial stream area =        0.193(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      601.000 to Point/Station      602.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   850.000(Ft.)
Downstream point/station elevation =   849.000(Ft.)
Pipe length  =    83.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.847(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.847(CFS)
Normal flow depth in pipe =    4.32(In.)
```

```
Flow top width inside pipe =    8.99(In.)
Critical Depth =    5.05(In.)
Pipe flow velocity =      4.04(Ft/s)
Travel time through pipe =    0.34 min.
Time of concentration (TC) =     7.50 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      602.000 to Point/Station      602.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     7.50 min.
Rainfall intensity =      7.100(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.376
Subarea runoff =      1.824(CFS) for      0.434(Ac.)
Total runoff =      2.671(CFS)        Total area =       0.627(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      602.000 to Point/Station      603.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   849.000(Ft.)
Downstream point/station elevation =   847.000(Ft.)
Pipe length  =   151.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.671(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.671(CFS)
Normal flow depth in pipe =    7.05(In.)
Flow top width inside pipe =   11.81(In.)
Critical Depth =    8.41(In.)
Pipe flow velocity =      5.56(Ft/s)
Travel time through pipe =    0.45 min.
Time of concentration (TC) =     7.95 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      603.000 to Point/Station      603.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     7.95 min.
Rainfall intensity =      6.836(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.725
Subarea runoff =      2.284(CFS) for      0.581(Ac.)
Total runoff =      4.955(CFS)        Total area =       1.208(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      603.000 to Point/Station      604.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   847.000(Ft.)
Downstream point/station elevation =   841.000(Ft.)
Pipe length  =    72.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.955(CFS)
```

```
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     4.955(CFS)
Normal flow depth in pipe =    5.87(In.)
Flow top width inside pipe =   12.00(In.)
Critical Depth =   10.98(In.)
Pipe flow velocity =     12.97(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =     8.04 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      604.000 to Point/Station      604.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      1.208(Ac.)
Runoff from this stream =      4.955(CFS)
Time of concentration =    8.04 min.
Rainfall intensity =     6.786(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      605.000 to Point/Station      606.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   87.000(Ft.)
Highest elevation =  853.000(Ft.)
Lowest elevation =  852.000(Ft.)
Elevation difference =    1.000(Ft.) Slope =  1.149 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 65.00 (Ft)
for the top area slope value of   1.15 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.93 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  65.000^.5)/(   1.149^(1/3)]=   6.93
Rainfall intensity (I) =      7.472(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.628(CFS)
Total initial stream area =        0.140(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      606.000 to Point/Station      607.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   850.000(Ft.)
Downstream point/station elevation =   848.000(Ft.)
Pipe length  =   122.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.628(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.628(CFS)
Normal flow depth in pipe =    4.35(In.)
Flow top width inside pipe =    5.36(In.)
Critical Depth =    4.83(In.)
Pipe flow velocity =      4.13(Ft/s)
Travel time through pipe =    0.49 min.
Time of concentration (TC) =     7.42 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      607.000 to Point/Station      607.000
```

```
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     7.42 min.
Rainfall intensity =      7.148(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.243
Subarea runoff =      1.109(CFS) for      0.265(Ac.)
Total runoff =      1.737(CFS)        Total area =       0.405(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      607.000 to Point/Station      608.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =   848.000(Ft.)
Downstream point/station elevation =   847.000(Ft.)
Pipe length  =    25.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.737(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.737(CFS)
Normal flow depth in pipe =    4.63(In.)
Flow top width inside pipe =    9.00(In.)
Critical Depth =    7.26(In.)
Pipe flow velocity =      7.58(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =     7.48 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      608.000 to Point/Station      608.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      0.405(Ac.)
Runoff from this stream =      1.737(CFS)
Time of concentration =    7.48 min.
Rainfall intensity =     7.114(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      609.000 to Point/Station      610.000
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  114.000(Ft.)
Highest elevation =  853.000(Ft.)
Lowest elevation =  852.000(Ft.)
Elevation difference =    1.000(Ft.) Slope =  0.877 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 65.00 (Ft)
for the top area slope value of   0.88 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.58 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  65.000^.5)/(   0.877^(1/3)]=   7.58
Rainfall intensity (I) =      7.051(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
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```
Subarea runoff =      1.134(CFS)
Total initial stream area =        0.268(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      610.000 to Point/Station      608.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   850.000(Ft.)
Downstream point/station elevation =   847.000(Ft.)
Pipe length  =   100.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.134(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.134(CFS)
Normal flow depth in pipe =    3.93(In.)
Flow top width inside pipe =    8.93(In.)
Critical Depth =    5.87(In.)
Pipe flow velocity =      6.11(Ft/s)
Travel time through pipe =    0.27 min.
Time of concentration (TC) =     7.85 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      608.000 to Point/Station      608.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     7.85 min.
Rainfall intensity =      6.892(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.327
Subarea runoff =      1.120(CFS) for      0.277(Ac.)
Total runoff =      2.254(CFS)        Total area =       0.545(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      608.000 to Point/Station      608.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.545(Ac.)
Runoff from this stream =      2.254(CFS)
Time of concentration =    7.85 min.
Rainfall intensity =     6.892(In/Hr)
Summary of stream data:

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


1        1.737      7.48               7.114
2        2.254      7.85               6.892
Qmax(1) =
          1.000 *    1.000 *     1.737) +
          1.000 *    0.952 *     2.254) + =       3.882
Qmax(2) =
          0.969 *    1.000 *     1.737) +
          1.000 *    1.000 *     2.254) + =       3.936

Total of 2 streams to confluence:
Flow rates before confluence point:
       1.737       2.254
Maximum flow rates at confluence using above data:
        3.882        3.936
Area of streams before confluence:
        0.405        0.545
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```
Results of confluence:
Total flow rate =      3.936(CFS)
Time of concentration =     7.853 min.
Effective stream area after confluence =      0.950(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      608.000 to Point/Station      604.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   847.000(Ft.)
Downstream point/station elevation =   841.000(Ft.)
Pipe length  =    65.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.936(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     3.936(CFS)
Normal flow depth in pipe =    6.00(In.)
Flow top width inside pipe =    8.49(In.)
Critical depth could not be calculated.
Pipe flow velocity =     12.59(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =     7.94 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      604.000 to Point/Station      604.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.950(Ac.)
Runoff from this stream =      3.936(CFS)
Time of concentration =    7.94 min.
Rainfall intensity =     6.843(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      611.000 to Point/Station      612.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  130.000(Ft.)
Highest elevation =  853.000(Ft.)
Lowest elevation =  852.000(Ft.)
Elevation difference =    1.000(Ft.) Slope =  0.769 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 65.00 (Ft)
for the top area slope value of   0.77 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.92 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  65.000^.5)/(   0.769^(1/3)]=   7.92
Rainfall intensity (I) =      6.854(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      1.172(CFS)
Total initial stream area =        0.285(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      612.000 to Point/Station      613.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   850.000(Ft.)
Downstream point/station elevation =   848.000(Ft.)
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Pipe length  =    90.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.172(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.172(CFS)
Normal flow depth in pipe =    4.37(In.)
Flow top width inside pipe =    9.00(In.)
Critical Depth =    5.98(In.)
Pipe flow velocity =      5.51(Ft/s)
Travel time through pipe =    0.27 min.
Time of concentration (TC) =     8.19 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      613.000 to Point/Station      613.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.19 min.
Rainfall intensity =      6.707(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.490
Subarea runoff =      2.111(CFS) for      0.531(Ac.)
Total runoff =      3.284(CFS)        Total area =       0.816(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      613.000 to Point/Station      614.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   848.000(Ft.)
Downstream point/station elevation =   847.000(Ft.)
Pipe length  =   102.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.284(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     3.284(CFS)
Normal flow depth in pipe =    9.16(In.)
Flow top width inside pipe =   10.20(In.)
Critical Depth =    9.31(In.)
Pipe flow velocity =      5.10(Ft/s)
Travel time through pipe =    0.33 min.
Time of concentration (TC) =     8.53 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      614.000 to Point/Station      614.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.53 min.
Rainfall intensity =      6.536(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.671
Subarea runoff =      1.105(CFS) for      0.303(Ac.)
Total runoff =      4.388(CFS)        Total area =       1.119(Ac.)


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Process from Point/Station      614.000 to Point/Station      604.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
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____________________________________________________________________
Upstream point/station elevation =   847.000(Ft.)
Downstream point/station elevation =   841.000(Ft.)
Pipe length  =    20.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.388(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     4.388(CFS)
Normal flow depth in pipe =    4.42(In.)
Flow top width inside pipe =    9.00(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.35(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =     8.54 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      604.000 to Point/Station      604.000
**** CONFLUENCE OF MAIN STREAMS ****
____________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      1.119(Ac.)
Runoff from this stream =      4.388(CFS)
Time of concentration =    8.54 min.
Rainfall intensity =     6.528(In/Hr)
Summary of stream data:

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


1        4.955      8.04               6.786
2        3.936      7.94               6.843
3        4.388      8.54               6.528
Qmax(1) =
          1.000 *    1.000 *     4.955) +
          0.992 *    1.000 *     3.936) +
          1.000 *    0.942 *     4.388) + =      12.991
Qmax(2) =
          1.000 *    0.987 *     4.955) +
          1.000 *    1.000 *     3.936) +
          1.000 *    0.929 *     4.388) + =      12.905
Qmax(3) =
          0.962 *    1.000 *     4.955) +
          0.954 *    1.000 *     3.936) +
          1.000 *    1.000 *     4.388) + =      12.910

Total of 3 main streams to confluence:
Flow rates before confluence point:
       4.955       3.936       4.388
Maximum flow rates at confluence using above data:
       12.991       12.905       12.910
Area of streams before confluence:
        1.208        0.950        1.119


Results of confluence:
Total flow rate =     12.991(CFS)
Time of concentration =     8.045 min.
Effective stream area after confluence  =      3.277(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      604.000 to Point/Station      615.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________
Upstream point/station elevation =   841.000(Ft.)
Downstream point/station elevation =   820.000(Ft.)
Pipe length  =   220.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.991(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    12.991(CFS)
Normal flow depth in pipe =    8.81(In.)
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Flow top width inside pipe =   14.77(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.32(Ft/s)
Travel time through pipe =    0.21 min.
Time of concentration (TC) =     8.26 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      615.000 to Point/Station      615.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.277(Ac.)
Runoff from this stream =     12.991(CFS)
Time of concentration =    8.26 min.
Rainfall intensity =     6.673(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      616.000 to Point/Station      617.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  835.000(Ft.)
Lowest elevation =  834.000(Ft.)
Elevation difference =    1.000(Ft.) Slope =  1.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 65.00 (Ft)
for the top area slope value of   1.00 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.26 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  65.000^.5)/(   1.000^(1/3)]=   7.26
Rainfall intensity (I) =      7.253(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      1.249(CFS)
Total initial stream area =        0.287(Ac.)


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Process from Point/Station      617.000 to Point/Station      618.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   832.000(Ft.)
Downstream point/station elevation =   828.000(Ft.)
Pipe length  =   123.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.249(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.249(CFS)
Normal flow depth in pipe =    4.06(In.)
Flow top width inside pipe =    8.96(In.)
Critical Depth =    6.17(In.)
Pipe flow velocity =      6.45(Ft/s)
Travel time through pipe =    0.32 min.
Time of concentration (TC) =     7.57 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      618.000 to Point/Station      618.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
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Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     7.57 min.
Rainfall intensity =      7.055(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.423
Subarea runoff =      1.735(CFS) for      0.418(Ac.)
Total runoff =      2.984(CFS)        Total area =       0.705(Ac.)


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Process from Point/Station      618.000 to Point/Station      615.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   828.000(Ft.)
Downstream point/station elevation =   820.000(Ft.)
Pipe length  =   107.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.984(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.984(CFS)
Normal flow depth in pipe =    5.34(In.)
Flow top width inside pipe =    8.84(In.)
Critical depth could not be calculated.
Pipe flow velocity =     10.94(Ft/s)
Travel time through pipe =    0.16 min.
Time of concentration (TC) =     7.74 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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 =      0.705(Ac.)
Runoff from this stream =      2.984(CFS)
Time of concentration =    7.74 min.
Rainfall intensity =     6.959(In/Hr)
Summary of stream data:

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


1       12.991      8.26               6.673
2        2.984      7.74               6.959
Qmax(1) =
          1.000 *    1.000 *    12.991) +
          0.959 *    1.000 *     2.984) + =      15.853
Qmax(2) =
          1.000 *    0.937 *    12.991) +
          1.000 *    1.000 *     2.984) + =      15.158

Total of 2 streams to confluence:
Flow rates before confluence point:
      12.991       2.984
Maximum flow rates at confluence using above data:
       15.853       15.158
Area of streams before confluence:
        3.277        0.705
Results of confluence:
Total flow rate =     15.853(CFS)
Time of concentration =     8.256 min.
Effective stream area after confluence =      3.982(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      615.000 to Point/Station      619.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   820.000(Ft.)
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Downstream point/station elevation =   810.000(Ft.)
Pipe length  =    81.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    15.853(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    15.853(CFS)
Normal flow depth in pipe =    9.23(In.)
Flow top width inside pipe =   14.59(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.00(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =     8.32 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      619.000 to Point/Station      619.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.32 min.
Rainfall intensity =      6.638(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      2.704
Subarea runoff =      2.097(CFS) for      0.525(Ac.)
Total runoff =     17.950(CFS)        Total area =       4.507(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      619.000 to Point/Station      620.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   810.000(Ft.)
Downstream point/station elevation =   791.000(Ft.)
Pipe length  =   140.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    17.950(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    17.950(CFS)
Normal flow depth in pipe =    9.73(In.)
Flow top width inside pipe =   14.32(In.)
Critical depth could not be calculated.
Pipe flow velocity =     21.30(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =     8.43 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      620.000 to Point/Station      620.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.43 min.
Rainfall intensity =      6.582(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      2.937
Subarea runoff =      1.382(CFS) for      0.388(Ac.)
Total runoff =     19.332(CFS)        Total area =       4.895(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      620.000 to Point/Station      621.000
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```
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   791.000(Ft.)
Downstream point/station elevation =   766.000(Ft.)
Pipe length  =   206.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    19.332(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    19.332(CFS)
Normal flow depth in pipe =   10.71(In.)
Flow top width inside pipe =   13.56(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.62(Ft/s)
Travel time through pipe =    0.17 min.
Time of concentration (TC) =     8.60 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      621.000 to Point/Station      621.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.60 min.
Rainfall intensity =      6.500(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      3.250
Subarea runoff =      1.790(CFS) for      0.521(Ac.)
Total runoff =     21.121(CFS)       Total area =       5.416(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      621.000 to Point/Station      622.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   766.000(Ft.)
Downstream point/station elevation =   737.000(Ft.)
Pipe length  =   264.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    21.121(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    21.121(CFS)
Normal flow depth in pipe =   12.12(In.)
Flow top width inside pipe =   11.82(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.89(Ft/s)
Travel time through pipe =    0.22 min.
Time of concentration (TC) =     8.82 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      622.000 to Point/Station      622.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.82 min.
Rainfall intensity =      6.394(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      3.428
Subarea runoff =      0.800(CFS) for      0.298(Ac.)
Total runoff =     21.921(CFS)       Total area =       5.714(Ac.)
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Process from Point/Station      622.000 to Point/Station      623.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   737.000(Ft.)
Downstream point/station elevation =   720.000(Ft.)
Pipe length  =   135.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    21.921(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    21.921(CFS)
Normal flow depth in pipe =   11.74(In.)
Flow top width inside pipe =   12.37(In.)
Critical depth could not be calculated.
Pipe flow velocity =     21.27(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =     8.93 min.


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Process from Point/Station      623.000 to Point/Station      623.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.93 min.
Rainfall intensity =      6.345(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      3.682
Subarea runoff =      1.442(CFS) for      0.423(Ac.)
Total runoff =     23.364(CFS)        Total area =       6.137(Ac.)


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Process from Point/Station      623.000 to Point/Station      624.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   720.000(Ft.)
Downstream point/station elevation =   702.000(Ft.)
Pipe length  =   125.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    23.364(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    23.364(CFS)
Normal flow depth in pipe =   11.71(In.)
Flow top width inside pipe =   12.42(In.)
Critical depth could not be calculated.
Pipe flow velocity =     22.74(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =     9.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      624.000 to Point/Station      624.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      6.137(Ac.)
Runoff from this stream =     23.364(CFS)
Time of concentration =    9.02 min.
Rainfall intensity =     6.303(In/Hr)


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Process from Point/Station      625.000 to Point/Station      626.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
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Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  123.000(Ft.)
Highest elevation =  714.500(Ft.)
Lowest elevation =  713.500(Ft.)
Elevation difference =    1.000(Ft.) Slope =  0.813 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 65.00 (Ft)
for the top area slope value of   0.81 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.77 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  65.000^.5)/(   0.813^(1/3)]=   7.77
Rainfall intensity (I) =      6.937(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.687(CFS)
Total initial stream area =        0.165(Ac.)


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Process from Point/Station      626.000 to Point/Station      627.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   711.000(Ft.)
Downstream point/station elevation =   710.000(Ft.)
Pipe length  =    87.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.687(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.687(CFS)
Normal flow depth in pipe =    3.88(In.)
Flow top width inside pipe =    8.92(In.)
Critical Depth =    4.52(In.)
Pipe flow velocity =      3.76(Ft/s)
Travel time through pipe =    0.39 min.
Time of concentration (TC) =     8.16 min.


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Process from Point/Station      627.000 to Point/Station      627.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.16 min.
Rainfall intensity =      6.723(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.314
Subarea runoff =      1.427(CFS) for      0.359(Ac.)
Total runoff =      2.114(CFS)        Total area =       0.524(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      627.000 to Point/Station      624.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   710.000(Ft.)
Downstream point/station elevation =   702.000(Ft.)
Pipe length  =   156.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.114(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.114(CFS)
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Normal flow depth in pipe =    4.84(In.)
Flow top width inside pipe =    8.97(In.)
Critical Depth =    7.87(In.)
Pipe flow velocity =      8.74(Ft/s)
Travel time through pipe =    0.30 min.
Time of concentration (TC) =     8.46 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      624.000 to Point/Station      624.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.46 min.
Rainfall intensity =      6.570(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.589
Subarea runoff =      1.753(CFS) for      0.457(Ac.)
Total runoff =      3.867(CFS)        Total area =       0.981(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      624.000 to Point/Station      624.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.981(Ac.)
Runoff from this stream =      3.867(CFS)
Time of concentration =    8.46 min.
Rainfall intensity =     6.570(In/Hr)
Summary of stream data:

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


1       23.364      9.02               6.303
2        3.867      8.46               6.570
Qmax(1) =
          1.000 *    1.000 *    23.364) +
          0.959 *    1.000 *     3.867) + =      27.074
Qmax(2) =
          1.000 *    0.938 *    23.364) +
          1.000 *    1.000 *     3.867) + =      25.778

Total of 2 streams to confluence:
Flow rates before confluence point:
      23.364       3.867
Maximum flow rates at confluence using above data:
       27.074       25.778
Area of streams before confluence:
        6.137        0.981
Results of confluence:
Total flow rate =     27.074(CFS)
Time of concentration =     9.019 min.
Effective stream area after confluence =      7.118(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      624.000 to Point/Station      628.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   702.000(Ft.)
Downstream point/station elevation =   696.000(Ft.)
Pipe length  =   274.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    27.074(CFS)
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```
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    27.074(CFS)
Normal flow depth in pipe =   16.36(In.)
Flow top width inside pipe =   22.36(In.)
Critical Depth =   21.73(In.)
Pipe flow velocity =     11.86(Ft/s)
Travel time through pipe =    0.39 min.
Time of concentration (TC) =     9.40 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      628.000 to Point/Station      628.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     9.40 min.
Rainfall intensity =      6.136(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      4.585
Subarea runoff =      1.059(CFS) for      0.524(Ac.)
Total runoff =     28.133(CFS)        Total area =       7.642(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      628.000 to Point/Station      629.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   696.000(Ft.)
Downstream point/station elevation =   692.000(Ft.)
Pipe length  =   168.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    28.133(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    28.133(CFS)
Normal flow depth in pipe =   16.34(In.)
Flow top width inside pipe =   22.38(In.)
Critical Depth =   21.96(In.)
Pipe flow velocity =     12.36(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =     9.63 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      629.000 to Point/Station      629.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     9.63 min.
Rainfall intensity =      6.042(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      4.837
Subarea runoff =      1.094(CFS) for      0.420(Ac.)
Total runoff =     29.227(CFS)        Total area =       8.062(Ac.)


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Process from Point/Station      629.000 to Point/Station      629.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
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Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Time of concentration =     9.63 min.
Rainfall intensity =      6.042(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.578  CA =      5.115
Subarea runoff =      1.679(CFS) for      0.794(Ac.)
Total runoff =     30.906(CFS)        Total area =       8.856(Ac.)


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Process from Point/Station      629.000 to Point/Station      630.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   692.000(Ft.)
Downstream point/station elevation =   691.000(Ft.)
Pipe length  =    65.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    30.906(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    30.906(CFS)
Normal flow depth in pipe =   18.35(In.)
Flow top width inside pipe =   25.20(In.)
Critical Depth =   23.06(In.)
Pipe flow velocity =     10.75(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     9.73 min.


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Process from Point/Station      630.000 to Point/Station      630.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      8.856(Ac.)
Runoff from this stream =     30.906(CFS)
Time of concentration =    9.73 min.
Rainfall intensity =     6.002(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      631.000 to Point/Station      632.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  106.000(Ft.)
Highest elevation =  702.000(Ft.)
Lowest elevation =  701.000(Ft.)
Elevation difference =    1.000(Ft.) Slope =  0.943 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 65.00 (Ft)
for the top area slope value of   0.94 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.40 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  65.000^.5)/(   0.943^(1/3)]=   7.40
Rainfall intensity (I) =      7.162(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.584(CFS)
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Total initial stream area =        0.136(Ac.)


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Process from Point/Station      632.000 to Point/Station      633.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   699.000(Ft.)
Downstream point/station elevation =   694.000(Ft.)
Pipe length  =   212.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.584(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.584(CFS)
Normal flow depth in pipe =    3.62(In.)
Flow top width inside pipe =    5.87(In.)
Critical Depth =    4.67(In.)
Pipe flow velocity =      4.72(Ft/s)
Travel time through pipe =    0.75 min.
Time of concentration (TC) =     8.15 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      633.000 to Point/Station      633.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.15 min.
Rainfall intensity =      6.730(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.424
Subarea runoff =      2.266(CFS) for      0.570(Ac.)
Total runoff =      2.851(CFS)        Total area =       0.706(Ac.)


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Process from Point/Station      633.000 to Point/Station      630.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   694.000(Ft.)
Downstream point/station elevation =   691.000(Ft.)
Pipe length  =   122.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.851(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.851(CFS)
Normal flow depth in pipe =    6.07(In.)
Flow top width inside pipe =   12.00(In.)
Critical Depth =    8.69(In.)
Pipe flow velocity =      7.15(Ft/s)
Travel time through pipe =    0.28 min.
Time of concentration (TC) =     8.43 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      630.000 to Point/Station      630.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.706(Ac.)
Runoff from this stream =      2.851(CFS)
Time of concentration =    8.43 min.
Rainfall intensity =     6.582(In/Hr)
Summary of stream data:

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

```
1       30.906      9.73               6.002
2        2.851      8.43               6.582
Qmax(1) =
          1.000 *    1.000 *    30.906) +
          0.912 *    1.000 *     2.851) + =      33.506
Qmax(2) =
          1.000 *    0.867 *    30.906) +
          1.000 *    1.000 *     2.851) + =      29.635

Total of 2 main streams to confluence:
Flow rates before confluence point:
      30.906       2.851
Maximum flow rates at confluence using above data:
       33.506       29.635
Area of streams before confluence:
        8.856        0.706


Results of confluence:
Total flow rate =     33.506(CFS)
Time of concentration =     9.731 min.
Effective stream area after confluence  =      9.562(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      630.000 to Point/Station      634.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   691.000(Ft.)
Downstream point/station elevation =   690.000(Ft.)
Pipe length  =    78.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    33.506(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    33.506(CFS)
Normal flow depth in pipe =   21.14(In.)
Flow top width inside pipe =   22.26(In.)
Critical Depth =   23.77(In.)
Pipe flow velocity =     10.04(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =     9.86 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      634.000 to Point/Station      634.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     9.86 min.
Rainfall intensity =      5.951(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.580  CA =      5.880
Subarea runoff =      1.486(CFS) for      0.569(Ac.)
Total runoff =     34.991(CFS)        Total area =      10.131(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      634.000 to Point/Station      635.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   690.000(Ft.)
Downstream point/station elevation =   687.000(Ft.)
Pipe length  =   138.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    34.991(CFS)
Nearest computed pipe diameter  =     27.00(In.)
```

```
Calculated individual pipe flow  =    34.991(CFS)
Normal flow depth in pipe =   17.72(In.)
Flow top width inside pipe =   25.65(In.)
Critical Depth =   24.13(In.)
Pipe flow velocity =     12.66(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =    10.04 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      635.000 to Point/Station      635.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     10.131(Ac.)
Runoff from this stream =     34.991(CFS)
Time of concentration =   10.04 min.
Rainfall intensity =     5.881(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      636.000 to Point/Station      637.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   96.000(Ft.)
Highest elevation =  751.500(Ft.)
Lowest elevation =  750.500(Ft.)
Elevation difference =    1.000(Ft.) Slope =  1.042 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 65.00 (Ft)
for the top area slope value of   1.04 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.16 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  65.000^.5)/(   1.042^(1/3)]=   7.16
Rainfall intensity (I) =      7.317(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.509(CFS)
Total initial stream area =        0.116(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      637.000 to Point/Station      638.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   748.000(Ft.)
Downstream point/station elevation =   736.000(Ft.)
Pipe length  =   215.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.509(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.509(CFS)
Normal flow depth in pipe =    2.58(In.)
Flow top width inside pipe =    5.94(In.)
Critical Depth =    4.36(In.)
Pipe flow velocity =      6.31(Ft/s)
Travel time through pipe =    0.57 min.
Time of concentration (TC) =     7.72 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      638.000 to Point/Station      638.000
**** SUBAREA FLOW ADDITION ****
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     7.72 min.
Rainfall intensity =      6.965(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.377
Subarea runoff =      2.115(CFS) for      0.512(Ac.)
Total runoff =      2.625(CFS)        Total area =       0.628(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      638.000 to Point/Station      639.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   736.000(Ft.)
Downstream point/station elevation =   726.000(Ft.)
Pipe length  =   100.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.625(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.625(CFS)
Normal flow depth in pipe =    4.51(In.)
Flow top width inside pipe =    9.00(In.)
Critical Depth =    8.41(In.)
Pipe flow velocity =     11.85(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     7.87 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      639.000 to Point/Station      639.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     7.87 min.
Rainfall intensity =      6.885(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.669
Subarea runoff =      1.981(CFS) for      0.487(Ac.)
Total runoff =      4.606(CFS)        Total area =       1.115(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      639.000 to Point/Station      640.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   726.000(Ft.)
Downstream point/station elevation =   715.000(Ft.)
Pipe length  =   114.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.606(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     4.606(CFS)
Normal flow depth in pipe =    6.66(In.)
Flow top width inside pipe =    7.90(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.16(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     8.01 min.
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      640.000 to Point/Station      640.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.01 min.
Rainfall intensity =      6.805(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.980
Subarea runoff =      2.061(CFS) for      0.518(Ac.)
Total runoff =      6.667(CFS)       Total area =       1.633(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      640.000 to Point/Station      641.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   715.000(Ft.)
Downstream point/station elevation =   696.000(Ft.)
Pipe length  =   170.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.667(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     6.667(CFS)
Normal flow depth in pipe =    6.42(In.)
Flow top width inside pipe =   11.97(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.59(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =     8.19 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      641.000 to Point/Station      641.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.19 min.
Rainfall intensity =      6.707(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      1.253
Subarea runoff =      1.735(CFS) for      0.455(Ac.)
Total runoff =      8.402(CFS)       Total area =       2.088(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      641.000 to Point/Station      642.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   696.000(Ft.)
Downstream point/station elevation =   688.000(Ft.)
Pipe length  =    78.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.402(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     8.402(CFS)
Normal flow depth in pipe =    7.65(In.)
Flow top width inside pipe =   11.54(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.88(Ft/s)
Travel time through pipe =    0.08 min.
```

```
Time of concentration (TC) =     8.27 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      642.000 to Point/Station      642.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.27 min.
Rainfall intensity =      6.664(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      1.492
Subarea runoff =      1.542(CFS) for      0.399(Ac.)
Total runoff =      9.944(CFS)        Total area =       2.487(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      642.000 to Point/Station      642.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      2.487(Ac.)
Runoff from this stream =      9.944(CFS)
Time of concentration =    8.27 min.
Rainfall intensity =     6.664(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      643.000 to Point/Station      644.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  114.000(Ft.)
Highest elevation =  751.500(Ft.)
Lowest elevation =  750.500(Ft.)
Elevation difference =    1.000(Ft.) Slope =  0.877 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 65.00 (Ft)
for the top area slope value of   0.88 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.58 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  65.000^.5)/(   0.877^(1/3)]=   7.58
Rainfall intensity (I) =      7.051(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.673(CFS)
Total initial stream area =        0.159(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      644.000 to Point/Station      645.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   748.500(Ft.)
Downstream point/station elevation =   741.000(Ft.)
Pipe length  =   166.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.673(CFS)
Nearest computed pipe diameter  =      6.00(In.)
```

```
Calculated individual pipe flow  =     0.673(CFS)
Normal flow depth in pipe =    3.22(In.)
Flow top width inside pipe =    5.98(In.)
Critical Depth =    4.98(In.)
Pipe flow velocity =      6.26(Ft/s)
Travel time through pipe =    0.44 min.
Time of concentration (TC) =     8.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      645.000 to Point/Station      645.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.02 min.
Rainfall intensity =      6.798(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.377
Subarea runoff =      1.889(CFS) for      0.469(Ac.)
Total runoff =      2.561(CFS)        Total area =       0.628(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      645.000 to Point/Station      646.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   741.000(Ft.)
Downstream point/station elevation =   709.000(Ft.)
Pipe length  =   236.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.561(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.561(CFS)
Normal flow depth in pipe =    4.07(In.)
Flow top width inside pipe =    8.96(In.)
Critical Depth =    8.36(In.)
Pipe flow velocity =     13.19(Ft/s)
Travel time through pipe =    0.30 min.
Time of concentration (TC) =     8.32 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      646.000 to Point/Station      646.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.32 min.
Rainfall intensity =      6.639(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.634
Subarea runoff =      1.649(CFS) for      0.429(Ac.)
Total runoff =      4.211(CFS)        Total area =       1.057(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      646.000 to Point/Station      647.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   709.000(Ft.)
Downstream point/station elevation =   689.000(Ft.)
```

```
Pipe length  =   192.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.211(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     4.211(CFS)
Normal flow depth in pipe =    6.02(In.)
Flow top width inside pipe =    8.47(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.39(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =     8.56 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      647.000 to Point/Station      647.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.56 min.
Rainfall intensity =      6.519(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.892
Subarea runoff =      1.606(CFS) for      0.430(Ac.)
Total runoff =      5.816(CFS)        Total area =       1.487(Ac.)


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Process from Point/Station      647.000 to Point/Station      642.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   689.000(Ft.)
Downstream point/station elevation =   688.000(Ft.)
Pipe length  =    72.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.816(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     5.816(CFS)
Normal flow depth in pipe =    9.82(In.)
Flow top width inside pipe =   14.26(In.)
Critical Depth =   11.71(In.)
Pipe flow velocity =      6.83(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =     8.74 min.


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Process from Point/Station      642.000 to Point/Station      642.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.487(Ac.)
Runoff from this stream =      5.816(CFS)
Time of concentration =    8.74 min.
Rainfall intensity =     6.434(In/Hr)
Summary of stream data:

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


1        9.944      8.27               6.664
2        5.816      8.74               6.434
Qmax(1) =
          1.000 *    1.000 *     9.944) +
          1.000 *    0.947 *     5.816) + =      15.453
Qmax(2) =
          0.966 *    1.000 *     9.944) +
          1.000 *    1.000 *     5.816) + =      15.418
```

```
Total of 2 streams to confluence:
Flow rates before confluence point:
       9.944       5.816
Maximum flow rates at confluence using above data:
       15.453       15.418
Area of streams before confluence:
        2.487        1.487
Results of confluence:
Total flow rate =     15.453(CFS)
Time of concentration =     8.274 min.
Effective stream area after confluence =      3.974(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      642.000 to Point/Station      635.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   688.000(Ft.)
Downstream point/station elevation =   687.000(Ft.)
Pipe length  =   104.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    15.453(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    15.453(CFS)
Normal flow depth in pipe =   17.11(In.)
Flow top width inside pipe =   16.32(In.)
Critical Depth =   17.44(In.)
Pipe flow velocity =      7.36(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =     8.51 min.


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Process from Point/Station      635.000 to Point/Station      635.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      3.974(Ac.)
Runoff from this stream =     15.453(CFS)
Time of concentration =    8.51 min.
Rainfall intensity =     6.544(In/Hr)
Summary of stream data:

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


1       34.991     10.04               5.881
2       15.453      8.51               6.544
Qmax(1) =
           1.000 *    1.000 *    34.991) +
           0.899 *    1.000 *    15.453) + =      48.878
Qmax(2) =
           1.000 *    0.847 *    34.991) +
           1.000 *    1.000 *    15.453) + =      45.102

Total of 2 main streams to confluence:
Flow rates before confluence point:
      34.991      15.453
Maximum flow rates at confluence using above data:
       48.878       45.102
Area of streams before confluence:
       10.131        3.974


Results of confluence:
Total flow rate =     48.878(CFS)
Time of concentration =    10.042 min.
Effective stream area after confluence  =     14.105(Ac.)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      635.000 to Point/Station      648.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   687.000(Ft.)
Downstream point/station elevation =   652.000(Ft.)
Pipe length  =   536.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    48.878(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    48.878(CFS)
Normal flow depth in pipe =   16.92(In.)
Flow top width inside pipe =   21.89(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.64(Ft/s)
Travel time through pipe =    0.43 min.
Time of concentration (TC) =    10.48 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      648.000 to Point/Station      648.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Time of concentration =    10.48 min.
Rainfall intensity =      5.723(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.567  CA =      8.684
Subarea runoff =      0.825(CFS) for      1.200(Ac.)
Total runoff =     49.703(CFS)       Total area =      15.305(Ac.)
End of computations, total study area =          15.305 (Ac.)
```

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                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2004 Version 7.4

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
        Rational Hydrology Study        Date: 02/18/13
----------------------------------------------------------------------
OUTFALL 9 - Las Posas Road: 200-243
POST DEVELOPMENT BEFORE DETENTION
100 Year Storm Event
File Name: 12052STEUNDET
----------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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


Program License Serial Number 4012

----------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   90.000(Ft.)
Highest elevation =  701.000(Ft.)
Lowest elevation =  698.000(Ft.)
Elevation difference =    3.000(Ft.) Slope =  3.333 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   3.33 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.72 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  90.000^.5)/(   3.330^(1/3)]=   5.72
Rainfall intensity (I) =      8.457(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.345(CFS)
Total initial stream area =        0.068(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   694.000(Ft.)
Downstream point/station elevation =   689.000(Ft.)
Pipe length  =   106.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.345(CFS)
Nearest computed pipe diameter  =      6.00(In.)
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```
Calculated individual pipe flow  =     0.345(CFS)
Normal flow depth in pipe =    2.18(In.)
Flow top width inside pipe =    5.77(In.)
Critical Depth =    3.58(In.)
Pipe flow velocity =      5.34(Ft/s)
Travel time through pipe =    0.33 min.
Time of concentration (TC) =     6.05 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.05 min.
Rainfall intensity =      8.156(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.089
Subarea runoff =      0.379(CFS) for      0.080(Ac.)
Total runoff =      0.724(CFS)        Total area =       0.148(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   689.000(Ft.)
Downstream point/station elevation =   687.000(Ft.)
Pipe length  =   106.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.724(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.724(CFS)
Normal flow depth in pipe =    4.62(In.)
Flow top width inside pipe =    5.05(In.)
Critical Depth =    5.13(In.)
Pipe flow velocity =      4.46(Ft/s)
Travel time through pipe =    0.40 min.
Time of concentration (TC) =     6.44 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.44 min.
Rainfall intensity =      7.829(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.136
Subarea runoff =      0.337(CFS) for      0.078(Ac.)
Total runoff =      1.062(CFS)        Total area =       0.226(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      204.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
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Upstream point/station elevation =   687.000(Ft.)
Downstream point/station elevation =   686.680(Ft.)
Pipe length  =    31.75(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.062(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.062(CFS)
Normal flow depth in pipe =    5.23(In.)
Flow top width inside pipe =    8.88(In.)
Critical Depth =    5.67(In.)
Pipe flow velocity =      3.99(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =     6.58 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      204.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.226(Ac.)
Runoff from this stream =      1.062(CFS)
Time of concentration =    6.58 min.
Rainfall intensity =     7.727(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      206.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   90.000(Ft.)
Highest elevation =  701.000(Ft.)
Lowest elevation =  698.000(Ft.)
Elevation difference =    3.000(Ft.) Slope =  3.333 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   3.33 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.72 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  90.000^.5)/(   3.330^(1/3)]=   5.72
Rainfall intensity (I) =      8.457(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.406(CFS)
Total initial stream area =        0.080(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      206.000 to Point/Station      207.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   694.000(Ft.)
Downstream point/station elevation =   688.500(Ft.)
Pipe length  =   106.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.406(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.406(CFS)
Normal flow depth in pipe =    2.33(In.)
Flow top width inside pipe =    5.85(In.)
Critical Depth =    3.89(In.)
Pipe flow velocity =      5.78(Ft/s)
Travel time through pipe =    0.31 min.
Time of concentration (TC) =     6.02 min.
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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      206.000 to Point/Station      207.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.02 min.
Rainfall intensity =      8.178(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.103
Subarea runoff =      0.433(CFS) for      0.091(Ac.)
Total runoff =      0.839(CFS)        Total area =       0.171(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      207.000 to Point/Station      208.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   688.500(Ft.)
Downstream point/station elevation =   687.000(Ft.)
Pipe length  =   106.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.839(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.839(CFS)
Normal flow depth in pipe =    4.10(In.)
Flow top width inside pipe =    8.96(In.)
Critical Depth =    5.03(In.)
Pipe flow velocity =      4.28(Ft/s)
Travel time through pipe =    0.41 min.
Time of concentration (TC) =     6.44 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      207.000 to Point/Station      208.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.44 min.
Rainfall intensity =      7.835(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.152
Subarea runoff =      0.350(CFS) for      0.082(Ac.)
Total runoff =      1.189(CFS)        Total area =       0.253(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      208.000 to Point/Station      204.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   687.000(Ft.)
Downstream point/station elevation =   686.680(Ft.)
Pipe length  =     5.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.189(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.189(CFS)
Normal flow depth in pipe =    4.20(In.)
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```
Flow top width inside pipe =    5.50(In.)
Critical depth could not be calculated.
Pipe flow velocity =      8.10(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =     6.45 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      204.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.253(Ac.)
Runoff from this stream =      1.189(CFS)
Time of concentration =    6.45 min.
Rainfall intensity =     7.827(In/Hr)
Summary of stream data:

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


1        1.062      6.58               7.727
2        1.189      6.45               7.827
Qmax(1) =
          1.000 *    1.000 *     1.062) +
          0.987 *    1.000 *     1.189) + =       2.236
Qmax(2) =
          1.000 *    0.980 *     1.062) +
          1.000 *    1.000 *     1.189) + =       2.230

Total of 2 streams to confluence:
Flow rates before confluence point:
       1.062       1.189
Maximum flow rates at confluence using above data:
        2.236        2.230
Area of streams before confluence:
        0.226        0.253
Results of confluence:
Total flow rate =      2.236(CFS)
Time of concentration =     6.577 min.
Effective stream area after confluence =      0.479(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      211.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   686.680(Ft.)
Downstream point/station elevation =   684.500(Ft.)
Pipe length  =    95.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.236(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.236(CFS)
Normal flow depth in pipe =    6.62(In.)
Flow top width inside pipe =    7.94(In.)
Critical Depth =    8.04(In.)
Pipe flow velocity =      6.41(Ft/s)
Travel time through pipe =    0.25 min.
Time of concentration (TC) =     6.82 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      211.000 to Point/Station      211.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.479(Ac.)
Runoff from this stream =      2.236(CFS)
Time of concentration =    6.82 min.
Rainfall intensity =     7.545(In/Hr)
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Process from Point/Station      203.000 to Point/Station      210.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  101.000(Ft.)
Highest elevation =  693.000(Ft.)
Lowest elevation =  691.000(Ft.)
Elevation difference =    2.000(Ft.) Slope =  1.980 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 80.00 (Ft)
for the top area slope value of   1.98 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.41 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  80.000^.5)/(   1.980^(1/3)]=   6.41
Rainfall intensity (I) =      7.856(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.401(CFS)
Total initial stream area =        0.085(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      210.000 to Point/Station      211.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   685.000(Ft.)
Downstream point/station elevation =   684.500(Ft.)
Pipe length  =    36.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.401(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.401(CFS)
Normal flow depth in pipe =    3.38(In.)
Flow top width inside pipe =    5.95(In.)
Critical Depth =    3.86(In.)
Pipe flow velocity =      3.53(Ft/s)
Travel time through pipe =    0.17 min.
Time of concentration (TC) =     6.58 min.


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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 =      0.085(Ac.)
Runoff from this stream =      0.401(CFS)
Time of concentration =    6.58 min.
Rainfall intensity =     7.724(In/Hr)


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Process from Point/Station      208.000 to Point/Station      209.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
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Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  101.000(Ft.)
Highest elevation =  693.000(Ft.)
Lowest elevation =  691.000(Ft.)
Elevation difference =    2.000(Ft.) Slope =  1.980 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 80.00 (Ft)
for the top area slope value of   1.98 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.41 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  80.000^.5)/(   1.980^(1/3)]=   6.41
Rainfall intensity (I) =      7.856(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.372(CFS)
Total initial stream area =        0.079(Ac.)


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Process from Point/Station      209.000 to Point/Station      211.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   685.000(Ft.)
Downstream point/station elevation =   684.500(Ft.)
Pipe length  =    10.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.372(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.372(CFS)
Normal flow depth in pipe =    2.24(In.)
Flow top width inside pipe =    5.81(In.)
Critical Depth =    3.72(In.)
Pipe flow velocity =      5.57(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     6.44 min.


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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 3
Stream flow area =      0.079(Ac.)
Runoff from this stream =      0.372(CFS)
Time of concentration =    6.44 min.
Rainfall intensity =     7.832(In/Hr)
Summary of stream data:

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


1        2.236      6.82               7.545
2        0.401      6.58               7.724
3        0.372      6.44               7.832
Qmax(1) =
          1.000 *    1.000 *     2.236) +
          0.977 *    1.000 *     0.401) +
          0.963 *    1.000 *     0.372) + =       2.986
Qmax(2) =
          1.000 *    0.964 *     2.236) +
          1.000 *    1.000 *     0.401) +
          0.986 *    1.000 *     0.372) + =       2.924
Qmax(3) =
          1.000 *    0.944 *     2.236) +
          1.000 *    0.979 *     0.401) +
          1.000 *    1.000 *     0.372) + =       2.875

Total of 3 streams to confluence:
Flow rates before confluence point:
```

```
       2.236       0.401       0.372
Maximum flow rates at confluence using above data:
        2.986        2.924        2.875
Area of streams before confluence:
        0.479        0.085        0.079
Results of confluence:
Total flow rate =      2.986(CFS)
Time of concentration =     6.824 min.
Effective stream area after confluence =      0.643(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      211.000 to Point/Station      212.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   684.500(Ft.)
Downstream point/station elevation =   683.900(Ft.)
Pipe length  =    60.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.986(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.986(CFS)
Normal flow depth in pipe =    8.40(In.)
Flow top width inside pipe =   11.00(In.)
Critical Depth =    8.89(In.)
Pipe flow velocity =      5.08(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =     7.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      212.000 to Point/Station      212.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.643(Ac.)
Runoff from this stream =      2.986(CFS)
Time of concentration =    7.02 min.
Rainfall intensity =     7.408(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      218.000 to Point/Station      219.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   92.000(Ft.)
Highest elevation =  749.500(Ft.)
Lowest elevation =  746.000(Ft.)
Elevation difference =    3.500(Ft.) Slope =  3.804 %
Top of Initial Area Slope adjusted by User to 11.579 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  11.58 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.98 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*( 100.000^.5)/(  11.579^(1/3)]=   3.98
Rainfall intensity (I) =     10.687(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.455(CFS)
Total initial stream area =        0.071(Ac.)
```

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Process from Point/Station      219.000 to Point/Station      220.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.712(CFS)
Depth of flow =   0.102(Ft.), Average velocity =   3.342(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             20.00              0.00
       3             20.50              0.50
Manning's 'N' friction factor =   0.013
----------------------------------------------------------------
Sub-Channel flow  =      0.712(CFS)
  '     '       flow top width =      4.179(Ft.)
  '     '    velocity=    3.342(Ft/s)
  '     '       area =      0.213(Sq.Ft)
  '     '       Froude number =     2.609

Upstream point elevation =   746.000(Ft.)
Downstream point elevation =   741.000(Ft.)
Flow length =   109.000(Ft.)
Travel time  =    0.54 min.
Time of concentration =    4.52 min.
Depth of flow =   0.102(Ft.)
Average velocity =   3.342(Ft/s)
Total irregular channel flow =     0.712(CFS)
Irregular channel normal depth above invert elev. =   0.102(Ft.)
Average velocity of channel(s) =   3.342(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity =      9.839(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.091
Subarea runoff =      0.436(CFS) for      0.080(Ac.)
Total runoff =      0.891(CFS)       Total area =       0.151(Ac.)
Depth of flow =   0.111(Ft.), Average velocity =   3.536(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      220.000 to Point/Station      213.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.095(CFS)
Depth of flow =   0.101(Ft.), Average velocity =   5.267(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             20.00              0.00
       3             20.50              0.50
Manning's 'N' friction factor =   0.013
----------------------------------------------------------------
Sub-Channel flow  =      1.095(CFS)
  '     '       flow top width =      4.129(Ft.)
  '     '    velocity=    5.267(Ft/s)
  '     '       area =      0.208(Sq.Ft)
  '     '       Froude number =     4.137

Upstream point elevation =   741.000(Ft.)
Downstream point elevation =   730.000(Ft.)
```

```
Flow length =    95.000(Ft.)
Travel time  =    0.30 min.
Time of concentration =    4.82 min.
Depth of flow =   0.101(Ft.)
Average velocity =   5.267(Ft/s)
Total irregular channel flow =     1.095(CFS)
Irregular channel normal depth above invert elev. =   0.101(Ft.)
Average velocity of channel(s) =   5.267(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity =      9.439(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.132
Subarea runoff =      0.355(CFS) for      0.069(Ac.)
Total runoff =      1.246(CFS)       Total area =       0.220(Ac.)
Depth of flow =   0.106(Ft.), Average velocity =   5.440(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      213.000 to Point/Station      214.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.217(CFS)
Depth of flow =   0.134(Ft.), Average velocity =   6.041(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1             0.00              0.50
       2            20.00              0.00
       3            20.50              0.50
Manning's 'N' friction factor =   0.013
----------------------------------------------------------------
Sub-Channel flow  =      2.217(CFS)
  '     '       flow top width =      5.486(Ft.)
  '     '    velocity=    6.041(Ft/s)
  '     '       area =      0.367(Sq.Ft)
  '     '       Froude number =     4.116

Upstream point elevation =   730.000(Ft.)
Downstream point elevation =   688.500(Ft.)
Flow length =   398.000(Ft.)
Travel time  =    1.10 min.
Time of concentration =    5.92 min.
Depth of flow =   0.134(Ft.)
Average velocity =   6.041(Ft/s)
Total irregular channel flow =     2.217(CFS)
Irregular channel normal depth above invert elev. =   0.134(Ft.)
Average velocity of channel(s) =   6.041(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity =      8.269(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.379
Subarea runoff =      1.885(CFS) for      0.411(Ac.)
Total runoff =      3.131(CFS)       Total area =       0.631(Ac.)
Depth of flow =   0.152(Ft.), Average velocity =   6.585(Ft/s)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      214.000 to Point/Station      215.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   686.500(Ft.)
Downstream point/station elevation =   686.000(Ft.)
Pipe length  =    25.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.131(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     3.131(CFS)
Normal flow depth in pipe =    6.84(In.)
Flow top width inside pipe =   11.88(In.)
Critical Depth =    9.10(In.)
Pipe flow velocity =      6.76(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     5.98 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      215.000 to Point/Station      216.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      3.268(CFS)
Depth of flow =   0.158(Ft.), Average velocity =   1.163(Ft/s)
       ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              3.75
       2              7.50              0.00
       3             25.00              0.00
       4             38.00              6.50
Manning's 'N' friction factor =   0.030
-----------------------------------------------------------------
Sub-Channel flow  =      3.268(CFS)
  '     '       flow top width =     18.131(Ft.)
  '     '    velocity=    1.163(Ft/s)
  '     '       area =      2.809(Sq.Ft)
  '     '       Froude number =     0.521

Upstream point elevation =   686.000(Ft.)
Downstream point elevation =   685.800(Ft.)
Flow length =    30.000(Ft.)
Travel time  =    0.43 min.
Time of concentration =    6.41 min.
Depth of flow =   0.158(Ft.)
Average velocity =   1.163(Ft/s)
Total irregular channel flow =     3.268(CFS)
Irregular channel normal depth above invert elev. =   0.158(Ft.)
Average velocity of channel(s) =   1.163(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity =      7.855(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.422
Subarea runoff =      0.187(CFS) for      0.073(Ac.)
Total runoff =      3.318(CFS)        Total area =       0.704(Ac.)
Depth of flow =   0.159(Ft.), Average velocity =   1.170(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      216.000 to Point/Station      212.000
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```
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =   684.000(Ft.)
Downstream point/station elevation =   683.000(Ft.)
Pipe length  =    31.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.318(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     3.318(CFS)
Normal flow depth in pipe =    6.13(In.)
Flow top width inside pipe =   12.00(In.)
Critical Depth =    9.36(In.)
Pipe flow velocity =      8.22(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     6.47 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      212.000 to Point/Station      212.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.704(Ac.)
Runoff from this stream =      3.318(CFS)
Time of concentration =    6.47 min.
Rainfall intensity =     7.806(In/Hr)
Summary of stream data:

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


1        2.986      7.02               7.408
2        3.318      6.47               7.806
Qmax(1) =
          1.000 *    1.000 *     2.986) +
          0.949 *    1.000 *     3.318) + =       6.135
Qmax(2) =
          1.000 *    0.922 *     2.986) +
          1.000 *    1.000 *     3.318) + =       6.071

Total of 2 streams to confluence:
Flow rates before confluence point:
       2.986       3.318
Maximum flow rates at confluence using above data:
        6.135        6.071
Area of streams before confluence:
        0.643        0.704
Results of confluence:
Total flow rate =      6.135(CFS)
Time of concentration =     7.021 min.
Effective stream area after confluence =      1.347(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      212.000 to Point/Station      217.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =   683.000(Ft.)
Downstream point/station elevation =   682.000(Ft.)
Pipe length  =    80.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.135(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     6.135(CFS)
Normal flow depth in pipe =   10.62(In.)
Flow top width inside pipe =   13.64(In.)
Critical Depth =   12.01(In.)
Pipe flow velocity =      6.61(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =     7.22 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      217.000 to Point/Station      217.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      1.347(Ac.)
Runoff from this stream =      6.135(CFS)
Time of concentration =    7.22 min.
Rainfall intensity =     7.274(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      226.000 to Point/Station      227.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation = 1030.000(Ft.)
Lowest elevation = 1010.000(Ft.)
Elevation difference =   20.000(Ft.) Slope = 20.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  20.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.97 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(  20.000^(1/3)]=   4.97
Rainfall intensity (I) =      9.253(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      0.408(CFS)
Total initial stream area =        0.126(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      227.000 to Point/Station      228.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      5.664(CFS)
Depth of flow =   0.436(Ft.), Average velocity =   6.488(Ft/s)
       ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              6.00
       2             25.00              0.00
       3             55.00              6.00
Manning's 'N' friction factor =   0.045
-----------------------------------------------------------------
Sub-Channel flow  =      5.664(CFS)
  '     '       flow top width =      4.001(Ft.)
  '     '    velocity=    6.488(Ft/s)
  '     '       area =      0.873(Sq.Ft)
  '     '       Froude number =     2.448

Upstream point elevation =  1010.000(Ft.)
Downstream point elevation =   732.000(Ft.)
Flow length =   917.000(Ft.)
Travel time  =    2.36 min.
Time of concentration =    7.33 min.
Depth of flow =   0.436(Ft.)
Average velocity =   6.488(Ft/s)
```

```
Total irregular channel flow =     5.664(CFS)
Irregular channel normal depth above invert elev. =   0.436(Ft.)
Average velocity of channel(s) =   6.488(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      7.206(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      1.507
Subarea runoff =     10.452(CFS) for      4.180(Ac.)
Total runoff =     10.860(CFS)        Total area =       4.306(Ac.)
Depth of flow =   0.557(Ft.), Average velocity =   7.635(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      228.000 to Point/Station      229.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   726.000(Ft.)
Downstream point/station elevation =   716.800(Ft.)
Pipe length  =   218.00(Ft.)   Manning's N = 0.013
No. of pipes = 2  Required pipe flow  =    10.860(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     5.430(CFS)
Normal flow depth in pipe =    7.70(In.)
Flow top width inside pipe =   11.51(In.)
Critical Depth =   11.24(In.)
Pipe flow velocity =     10.21(Ft/s)
Travel time through pipe =    0.36 min.
Time of concentration (TC) =     7.69 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      229.000 to Point/Station      229.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      4.306(Ac.)
Runoff from this stream =     10.860(CFS)
Time of concentration =    7.69 min.
Rainfall intensity =     6.989(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      230.000 to Point/Station      231.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =   97.000(Ft.)
Highest elevation =  880.000(Ft.)
Lowest elevation =  858.000(Ft.)
Elevation difference =   22.000(Ft.) Slope = 22.680 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  22.68 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.77 minutes
```

```
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(  22.680^(1/3)]=   4.77
Rainfall intensity (I) =      9.507(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      0.223(CFS)
Total initial stream area =        0.067(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      231.000 to Point/Station      232.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.044(CFS)
Depth of flow =   0.224(Ft.), Average velocity =   3.707(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              2.00
       2             17.00              0.00
       3             44.00              2.00
Manning's 'N' friction factor =   0.045
----------------------------------------------------------------
Sub-Channel flow  =      2.044(CFS)
  '     '       flow top width =      4.925(Ft.)
  '     '    velocity=    3.707(Ft/s)
  '     '       area =      0.551(Sq.Ft)
  '     '       Froude number =     1.953

Upstream point elevation =   858.000(Ft.)
Downstream point elevation =   717.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    2.70 min.
Time of concentration =    7.47 min.
Depth of flow =   0.224(Ft.)
Average velocity =   3.707(Ft/s)
Total irregular channel flow =     2.044(CFS)
Irregular channel normal depth above invert elev. =   0.224(Ft.)
Average velocity of channel(s) =   3.707(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      7.120(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      0.530
Subarea runoff =      3.550(CFS) for      1.447(Ac.)
Total runoff =      3.773(CFS)       Total area =       1.514(Ac.)
Depth of flow =   0.282(Ft.), Average velocity =   4.321(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      232.000 to Point/Station      229.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   717.000(Ft.)
Downstream point/station elevation =   716.800(Ft.)
Pipe length  =    15.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.773(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     3.773(CFS)
Normal flow depth in pipe =    9.05(In.)
Flow top width inside pipe =   10.34(In.)
Critical Depth =    9.92(In.)
Pipe flow velocity =      5.94(Ft/s)
Travel time through pipe =    0.04 min.
```

```
Time of concentration (TC) =     7.51 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      229.000 to Point/Station      229.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.514(Ac.)
Runoff from this stream =      3.773(CFS)
Time of concentration =    7.51 min.
Rainfall intensity =     7.094(In/Hr)
Summary of stream data:

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


1       10.860      7.69               6.989
2        3.773      7.51               7.094
Qmax(1) =
          1.000 *    1.000 *    10.860) +
          0.985 *    1.000 *     3.773) + =      14.577
Qmax(2) =
          1.000 *    0.977 *    10.860) +
          1.000 *    1.000 *     3.773) + =      14.384

Total of 2 streams to confluence:
Flow rates before confluence point:
      10.860       3.773
Maximum flow rates at confluence using above data:
       14.577       14.384
Area of streams before confluence:
        4.306        1.514
Results of confluence:
Total flow rate =     14.577(CFS)
Time of concentration =     7.685 min.
Effective stream area after confluence =      5.820(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      229.000 to Point/Station      225.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   716.800(Ft.)
Downstream point/station elevation =   715.000(Ft.)
Pipe length  =   192.00(Ft.)   Manning's N = 0.013
No. of pipes = 2  Required pipe flow  =    14.577(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     7.288(CFS)
Normal flow depth in pipe =   11.27(In.)
Flow top width inside pipe =   17.42(In.)
Critical Depth =   12.54(In.)
Pipe flow velocity =      6.26(Ft/s)
Travel time through pipe =    0.51 min.
Time of concentration (TC) =     8.20 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      225.000 to Point/Station      225.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      5.820(Ac.)
Runoff from this stream =     14.577(CFS)
Time of concentration =    8.20 min.
Rainfall intensity =     6.704(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      222.000 to Point/Station      223.000
```

```
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   98.000(Ft.)
Highest elevation =  750.000(Ft.)
Lowest elevation =  746.000(Ft.)
Elevation difference =    4.000(Ft.) Slope =  4.082 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   4.08 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.63 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*( 100.000^.5)/(   4.080^(1/3)]=   5.63
Rainfall intensity (I) =      8.540(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.379(CFS)
Total initial stream area =        0.074(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      223.000 to Point/Station      224.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.576(CFS)
Depth of flow =   0.095(Ft.), Average velocity =   3.091(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             20.00              0.00
       3             20.50              0.50
Manning's 'N' friction factor =   0.013
----------------------------------------------------------------
Sub-Channel flow  =      0.576(CFS)
  '     '       flow top width =      3.911(Ft.)
  '     '    velocity=    3.091(Ft/s)
  '     '       area =      0.187(Sq.Ft)
  '     '       Froude number =     2.494

Upstream point elevation =   746.000(Ft.)
Downstream point elevation =   741.500(Ft.)
Flow length =   105.000(Ft.)
Travel time  =    0.57 min.
Time of concentration =    6.20 min.
Depth of flow =   0.095(Ft.)
Average velocity =   3.091(Ft/s)
Total irregular channel flow =     0.576(CFS)
Irregular channel normal depth above invert elev. =   0.095(Ft.)
Average velocity of channel(s) =   3.091(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity =      8.028(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.091
```

```
Subarea runoff =      0.348(CFS) for      0.077(Ac.)
Total runoff =      0.727(CFS)       Total area =       0.151(Ac.)
Depth of flow =   0.104(Ft.), Average velocity =   3.276(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      224.000 to Point/Station      225.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   737.500(Ft.)
Downstream point/station elevation =   715.000(Ft.)
Pipe length  =   200.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.727(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.727(CFS)
Normal flow depth in pipe =    2.59(In.)
Flow top width inside pipe =    5.94(In.)
Critical Depth =    5.14(In.)
Pipe flow velocity =      8.97(Ft/s)
Travel time through pipe =    0.37 min.
Time of concentration (TC) =     6.57 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      225.000 to Point/Station      225.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.151(Ac.)
Runoff from this stream =      0.727(CFS)
Time of concentration =    6.57 min.
Rainfall intensity =     7.732(In/Hr)
Summary of stream data:

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


1       14.577      8.20               6.704
2        0.727      6.57               7.732
Qmax(1) =
          1.000 *    1.000 *    14.577) +
          0.867 *    1.000 *     0.727) + =      15.207
Qmax(2) =
          1.000 *    0.802 *    14.577) +
          1.000 *    1.000 *     0.727) + =      12.412

Total of 2 streams to confluence:
Flow rates before confluence point:
      14.577       0.727
Maximum flow rates at confluence using above data:
       15.207       12.412
Area of streams before confluence:
        5.820        0.151
Results of confluence:
Total flow rate =     15.207(CFS)
Time of concentration =     8.196 min.
Effective stream area after confluence =      5.971(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      225.000 to Point/Station      217.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   715.000(Ft.)
Downstream point/station elevation =   682.000(Ft.)
Pipe length  =   350.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    15.207(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    15.207(CFS)
Normal flow depth in pipe =    9.84(In.)
```

```
Flow top width inside pipe =   14.25(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.82(Ft/s)
Travel time through pipe =    0.33 min.
Time of concentration (TC) =     8.52 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      217.000 to Point/Station      217.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      5.971(Ac.)
Runoff from this stream =     15.207(CFS)
Time of concentration =    8.52 min.
Rainfall intensity =     6.537(In/Hr)
Summary of stream data:

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


1        6.135      7.22               7.274
2       15.207      8.52               6.537
Qmax(1) =
           1.000 *    1.000 *     6.135) +
           1.000 *    0.847 *    15.207) + =      19.021
Qmax(2) =
           0.899 *    1.000 *     6.135) +
           1.000 *    1.000 *    15.207) + =      20.721

Total of 2 main streams to confluence:
Flow rates before confluence point:
       6.135      15.207
Maximum flow rates at confluence using above data:
       19.021       20.721
Area of streams before confluence:
        1.347        5.971


Results of confluence:
Total flow rate =     20.721(CFS)
Time of concentration =     8.524 min.
Effective stream area after confluence  =      7.318(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      217.000 to Point/Station      233.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   682.000(Ft.)
Downstream point/station elevation =   679.000(Ft.)
Pipe length  =   125.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    20.721(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    20.721(CFS)
Normal flow depth in pipe =   14.79(In.)
Flow top width inside pipe =   19.17(In.)
Critical Depth =   19.38(In.)
Pipe flow velocity =     11.44(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =     8.71 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      233.000 to Point/Station      233.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      7.318(Ac.)
```

```
Runoff from this stream =     20.721(CFS)
Time of concentration =    8.71 min.
Rainfall intensity =     6.449(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      224.000 to Point/Station      234.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  741.500(Ft.)
Lowest elevation =  732.000(Ft.)
Elevation difference =    9.500(Ft.) Slope =  9.500 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   9.50 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.25 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*( 100.000^.5)/(   9.500^(1/3)]=   4.25
Rainfall intensity (I) =     10.242(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.430(CFS)
Total initial stream area =        0.070(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      234.000 to Point/Station      235.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.997(CFS)
Depth of flow =   0.132(Ft.), Average velocity =   5.630(Ft/s)
        ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              0.50
        2             20.00              0.00
        3             20.50              0.50
Manning's 'N' friction factor =   0.013
----------------------------------------------------------------
Sub-Channel flow  =      1.997(CFS)
  '     '       flow top width =      5.393(Ft.)
  '     '    velocity=    5.630(Ft/s)
  '     '       area =      0.355(Sq.Ft)
  '     '       Froude number =     3.868

Upstream point elevation =   732.000(Ft.)
Downstream point elevation =   688.000(Ft.)
Flow length =   475.000(Ft.)
Travel time  =    1.41 min.
Time of concentration =    5.66 min.
Depth of flow =   0.132(Ft.)
Average velocity =   5.630(Ft/s)
Total irregular channel flow =     1.997(CFS)
Irregular channel normal depth above invert elev. =   0.132(Ft.)
Average velocity of channel(s) =   5.630(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
```

```
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity =      8.517(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.407
Subarea runoff =      3.040(CFS) for      0.609(Ac.)
Total runoff =      3.470(CFS)       Total area =       0.679(Ac.)
Depth of flow =   0.162(Ft.), Average velocity =   6.463(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      235.000 to Point/Station      236.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   685.000(Ft.)
Downstream point/station elevation =   684.000(Ft.)
Pipe length  =    71.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.470(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     3.470(CFS)
Normal flow depth in pipe =    8.27(In.)
Flow top width inside pipe =   11.11(In.)
Critical Depth =    9.55(In.)
Pipe flow velocity =      6.01(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =     5.85 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      236.000 to Point/Station      237.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      3.616(CFS)
Depth of flow =   0.130(Ft.), Average velocity =   1.616(Ft/s)
       ******* Irregular Channel Data ***********
-------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              3.50
       2              7.50              0.00
       3             24.50              0.00
       4             40.00              7.50
Manning's 'N' friction factor =   0.030
-------------------------------------------------------------------
Sub-Channel flow  =      3.616(CFS)
  '     '       flow top width =     17.545(Ft.)
  '     '    velocity=    1.616(Ft/s)
  '     '       area =      2.237(Sq.Ft)
  '     '       Froude number =     0.798

Upstream point elevation =   684.000(Ft.)
Downstream point elevation =   683.500(Ft.)
Flow length =    30.000(Ft.)
Travel time  =    0.31 min.
Time of concentration =    6.16 min.
Depth of flow =   0.130(Ft.)
Average velocity =   1.616(Ft/s)
Total irregular channel flow =     3.616(CFS)
Irregular channel normal depth above invert elev. =   0.130(Ft.)
Average velocity of channel(s) =   1.616(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
```

```
Rainfall intensity =      8.059(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.460
Subarea runoff =      0.239(CFS) for      0.088(Ac.)
Total runoff =      3.709(CFS)        Total area =       0.767(Ac.)
Depth of flow =   0.131(Ft.), Average velocity =   1.632(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      237.000 to Point/Station      233.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   679.500(Ft.)
Downstream point/station elevation =   679.000(Ft.)
Pipe length  =    40.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.709(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     3.709(CFS)
Normal flow depth in pipe =    9.16(In.)
Flow top width inside pipe =   10.20(In.)
Critical Depth =    9.84(In.)
Pipe flow velocity =      5.76(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =     6.28 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      233.000 to Point/Station      233.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.767(Ac.)
Runoff from this stream =      3.709(CFS)
Time of concentration =    6.28 min.
Rainfall intensity =     7.963(In/Hr)
Summary of stream data:

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


1       20.721      8.71               6.449
2        3.709      6.28               7.963
Qmax(1) =
          1.000 *    1.000 *    20.721) +
          0.810 *    1.000 *     3.709) + =      23.724
Qmax(2) =
          1.000 *    0.721 *    20.721) +
          1.000 *    1.000 *     3.709) + =      18.650

Total of 2 streams to confluence:
Flow rates before confluence point:
      20.721       3.709
Maximum flow rates at confluence using above data:
       23.724       18.650
Area of streams before confluence:
        7.318        0.767
Results of confluence:
Total flow rate =     23.724(CFS)
Time of concentration =     8.706 min.
Effective stream area after confluence =      8.085(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      233.000 to Point/Station      238.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   679.000(Ft.)
Downstream point/station elevation =   678.000(Ft.)
Pipe length  =    47.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    23.724(CFS)
```

```
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    23.724(CFS)
Normal flow depth in pipe =   15.07(In.)
Flow top width inside pipe =   23.20(In.)
Critical Depth =   20.72(In.)
Pipe flow velocity =     11.43(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =     8.77 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      238.000 to Point/Station      238.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      8.085(Ac.)
Runoff from this stream =     23.724(CFS)
Time of concentration =    8.77 min.
Rainfall intensity =     6.416(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      239.000 to Point/Station      240.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =   98.000(Ft.)
Highest elevation =  740.000(Ft.)
Lowest elevation =  723.000(Ft.)
Elevation difference =   17.000(Ft.) Slope = 17.347 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  17.35 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.22 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3500)*( 100.000^.5)/(  17.347^(1/3)]=   5.22
Rainfall intensity (I) =      8.974(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      0.195(CFS)
Total initial stream area =        0.062(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      240.000 to Point/Station      241.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.400(CFS)
Depth of flow =   0.232(Ft.), Average velocity =   1.819(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              5.00
       2             27.00              0.00
       3             45.00              6.50
Manning's 'N' friction factor =   0.045
----------------------------------------------------------------
Sub-Channel flow  =      0.400(CFS)
  '     '       flow top width =      1.897(Ft.)
  '     '    velocity=    1.819(Ft/s)
  '     '       area =      0.220(Sq.Ft)
  '     '       Froude number =     0.941
```

```
Upstream point elevation =   723.000(Ft.)
Downstream point elevation =   715.000(Ft.)
Flow length =   143.000(Ft.)
Travel time  =    1.31 min.
Time of concentration =    6.53 min.
Depth of flow =   0.232(Ft.)
Average velocity =   1.819(Ft/s)
Total irregular channel flow =     0.400(CFS)
Irregular channel normal depth above invert elev. =   0.232(Ft.)
Average velocity of channel(s) =   1.819(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      7.767(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      0.068
Subarea runoff =      0.330(CFS) for      0.131(Ac.)
Total runoff =      0.525(CFS)       Total area =       0.193(Ac.)
Depth of flow =   0.257(Ft.), Average velocity =   1.946(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      241.000 to Point/Station      242.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Depth of flow =   0.245(Ft.), Average velocity =   6.971(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              1.00
       2              1.25              0.00
       3              2.50              1.00
Manning's 'N' friction factor =   0.013
----------------------------------------------------------------
Sub-Channel flow  =      0.525(CFS)
  '     '       flow top width =      0.613(Ft.)
  '     '    velocity=    6.971(Ft/s)
  '     '       area =      0.075(Sq.Ft)
  '     '       Froude number =     3.507

Upstream point elevation =   715.000(Ft.)
Downstream point elevation =   687.000(Ft.)
Flow length =   330.000(Ft.)
Travel time  =    0.79 min.
Time of concentration =    7.31 min.
Depth of flow =   0.245(Ft.)
Average velocity =   6.971(Ft/s)
Total irregular channel flow =     0.525(CFS)
Irregular channel normal depth above invert elev. =   0.245(Ft.)
Average velocity of channel(s) =   6.971(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      242.000 to Point/Station      238.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   681.000(Ft.)
Downstream point/station elevation =   678.000(Ft.)
Pipe length  =    40.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.525(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.525(CFS)
Normal flow depth in pipe =    2.42(In.)
```

```
Flow top width inside pipe =    5.89(In.)
Critical Depth =    4.43(In.)
Pipe flow velocity =      7.09(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =     7.41 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      238.000 to Point/Station      238.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.193(Ac.)
Runoff from this stream =      0.525(CFS)
Time of concentration =    7.41 min.
Rainfall intensity =     7.156(In/Hr)
Summary of stream data:

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


1       23.724      8.77               6.416
2        0.525      7.41               7.156
Qmax(1) =
          1.000 *    1.000 *    23.724) +
          0.897 *    1.000 *     0.525) + =      24.195
Qmax(2) =
          1.000 *    0.844 *    23.724) +
          1.000 *    1.000 *     0.525) + =      20.555

Total of 2 streams to confluence:
Flow rates before confluence point:
      23.724       0.525
Maximum flow rates at confluence using above data:
       24.195       20.555
Area of streams before confluence:
        8.085        0.193
Results of confluence:
Total flow rate =     24.195(CFS)
Time of concentration =     8.774 min.
Effective stream area after confluence =      8.278(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      238.000 to Point/Station      243.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   678.000(Ft.)
Downstream point/station elevation =   662.000(Ft.)
Pipe length  =    83.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    24.195(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    24.195(CFS)
Normal flow depth in pipe =   10.65(In.)
Flow top width inside pipe =   13.61(In.)
Critical depth could not be calculated.
Pipe flow velocity =     25.96(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =     8.83 min.
End of computations, total study area =           8.278 (Ac.)
```

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2004 Version 7.4

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
       Rational Hydrology Study        Date: 02/19/13
----------------------------------------------------------------------
FINAL OUTFALL 10 - Las Posas Road: Node 1 TO 6
POST DEVELOPMENT BEFORE DETENTION
100 Year Storm Event
File Name: 12052POSTOVERALL.RD3
----------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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


Program License Serial Number 4012

----------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Initial subarea total flow distance  = 1012.000(Ft.)
Highest elevation = 1140.000(Ft.)
Lowest elevation =  900.000(Ft.)
Elevation difference =  240.000(Ft.) Slope = 23.715 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  23.72 %, in a development type of
 1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.32 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4100)*( 100.000^.5)/(  23.715^(1/3)]=   4.32
The initial area total distance of 1012.00 (Ft.) entered leaves a
remaining distance of  912.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   2.58 minutes
for a distance of 912.00 (Ft.) and a slope of 23.72 %
with an elevation difference of 216.28(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    2.585 Minutes
Tt=[(11.9*0.1727^3)/(216.28)]^.385=  2.58
Total initial area Ti =   4.32 minutes from Figure 3-3 formula plus
  2.58 minutes from the Figure 3-4 formula =   6.91 minutes
Rainfall intensity (I) =      7.486(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
Subarea runoff =     45.998(CFS)
Total initial stream area =       14.986(Ac.)


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Process from Point/Station        2.000 to Point/Station        3.000
```

```
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_____________________________________________________________________
Estimated mean flow rate at midpoint of channel =    148.425(CFS)
Depth of flow =   1.083(Ft.), Average velocity =  12.664(Ft/s)
       ******* Irregular Channel Data ***********
-------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00             10.00
       2            100.00              0.00
       3            200.00             10.00
Manning's 'N' friction factor =   0.020
-------------------------------------------------------------------
Sub-Channel flow  =    148.425(CFS)
  '     '       flow top width =     21.652(Ft.)
  '     '    velocity=   12.664(Ft/s)
  '     '       area =     11.720(Sq.Ft)
  '     '       Froude number =     3.033

Upstream point elevation =   900.000(Ft.)
Downstream point elevation =   721.000(Ft.)
Flow length =  2700.000(Ft.)
Travel time  =    3.55 min.
Time of concentration =   10.46 min.
Depth of flow =   1.083(Ft.)
Average velocity =  12.664(Ft/s)
Total irregular channel flow =   148.425(CFS)
Irregular channel normal depth above invert elev. =   1.083(Ft.)
Average velocity of channel(s) =  12.664(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                     ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Rainfall intensity =      5.728(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.410  CA =     43.782
Subarea runoff =    204.795(CFS) for     91.800(Ac.)
Total runoff =    250.793(CFS)        Total area =     106.786(Ac.)
Depth of flow =   1.318(Ft.), Average velocity =  14.439(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        4.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_____________________________________________________________________
Estimated mean flow rate at midpoint of channel =    307.673(CFS)
Depth of flow =   1.722(Ft.), Average velocity =  10.375(Ft/s)
       ******* Irregular Channel Data ***********
-------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              5.00
       2            100.00              0.00
       3            100.00              5.00
Manning's 'N' friction factor =   0.023
-------------------------------------------------------------------
Sub-Channel flow  =    307.673(CFS)
  '     '       flow top width =     34.441(Ft.)
  '     '    velocity=   10.375(Ft/s)
  '     '       area =     29.655(Sq.Ft)
  '     '       Froude number =     1.970

Upstream point elevation =   721.000(Ft.)
Downstream point elevation =   668.000(Ft.)
Flow length =  1575.000(Ft.)
Travel time  =    2.53 min.
Time of concentration =   12.99 min.
Depth of flow =   1.722(Ft.)
Average velocity =  10.375(Ft/s)
```

```
Total irregular channel flow =   307.673(CFS)
Irregular channel normal depth above invert elev. =   1.722(Ft.)
Average velocity of channel(s) =  10.375(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Rainfall intensity =      4.981(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.410  CA =     73.172
Subarea runoff =    113.696(CFS) for     71.682(Ac.)
Total runoff =    364.490(CFS)        Total area =     178.468(Ac.)
Depth of flow =   1.835(Ft.), Average velocity =  10.824(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        4.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    178.468(Ac.)
Runoff from this stream =    364.490(CFS)
Time of concentration =   12.99 min.
Rainfall intensity =     4.981(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station       10.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Initial subarea total flow distance  = 1909.000(Ft.)
Highest elevation = 1302.000(Ft.)
Lowest elevation =  820.000(Ft.)
Elevation difference =  482.000(Ft.) Slope = 25.249 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  25.25 %, in a development type of
 1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.23 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4100)*( 100.000^.5)/(  25.249^(1/3)]=   4.23
The initial area total distance of 1909.00 (Ft.) entered leaves a
remaining distance of 1809.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   4.28 minutes
for a distance of 1809.00 (Ft.) and a slope of 25.25 %
with an elevation difference of 456.75(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    4.275 Minutes
Tt=[(11.9*0.3426^3)/(456.75)]^.385=  4.28
Total initial area Ti =   4.23 minutes from Figure 3-3 formula plus
  4.28 minutes from the Figure 3-4 formula =   8.51 minutes
Rainfall intensity (I) =      6.544(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
Subarea runoff =     60.081(CFS)
Total initial stream area =       22.391(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station        4.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

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_____________________________________________________________________
Estimated mean flow rate at midpoint of channel =    194.618(CFS)
Depth of flow =   0.918(Ft.), Average velocity =  11.540(Ft/s)
       ******* Irregular Channel Data ***********
-------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              5.00
       2            100.00              0.00
       3            200.00              5.00
Manning's 'N' friction factor =   0.020
-------------------------------------------------------------------
Sub-Channel flow  =    194.618(CFS)
  '     '       flow top width =     36.731(Ft.)
  '     '    velocity=   11.540(Ft/s)
  '     '       area =     16.864(Sq.Ft)
  '     '       Froude number =     3.001

Upstream point elevation =   820.000(Ft.)
Downstream point elevation =   668.000(Ft.)
Flow length =  2228.000(Ft.)
Travel time  =    3.22 min.
Time of concentration =   11.73 min.
Depth of flow =   0.918(Ft.)
Average velocity =  11.540(Ft/s)
Total irregular channel flow =   194.618(CFS)
Irregular channel normal depth above invert elev. =   0.918(Ft.)
Average velocity of channel(s) =  11.540(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Rainfall intensity =      5.321(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.410  CA =     61.845
Subarea runoff =    269.022(CFS) for    128.450(Ac.)
Total runoff =    329.102(CFS)        Total area =     150.841(Ac.)
Depth of flow =   1.118(Ft.), Average velocity =  13.160(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        4.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =    150.841(Ac.)
Runoff from this stream =    329.102(CFS)
Time of concentration =   11.73 min.
Rainfall intensity =     5.321(In/Hr)
Summary of stream data:

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


1      364.490     12.99               4.981
2      329.102     11.73               5.321
Qmax(1) =
          1.000 *    1.000 *   364.490) +
          0.936 *    1.000 *   329.102) + =     672.557
Qmax(2) =
          1.000 *    0.903 *   364.490) +
          1.000 *    1.000 *   329.102) + =     658.114

Total of 2 streams to confluence:
Flow rates before confluence point:
     364.490     329.102
Maximum flow rates at confluence using above data:
      672.557      658.114
```

```
Area of streams before confluence:
      178.468      150.841
Results of confluence:
Total flow rate =    672.557(CFS)
Time of concentration =    12.991 min.
Effective stream area after confluence =    329.309(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        4.200
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Depth of flow =   3.950(Ft.), Average velocity =   6.898(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00             16.00
       2            100.00              0.00
       3            200.00             16.00
Manning's 'N' friction factor =   0.045
----------------------------------------------------------------
Sub-Channel flow  =    672.556(CFS)
  '     '       flow top width =     49.371(Ft.)
  '     '    velocity=    6.898(Ft/s)
  '     '       area =     97.500(Sq.Ft)
  '     '       Froude number =     0.865

Upstream point elevation =   668.000(Ft.)
Downstream point elevation =   656.000(Ft.)
Flow length =   670.000(Ft.)
Travel time  =    1.62 min.
Time of concentration =   14.61 min.
Depth of flow =   3.950(Ft.)
Average velocity =   6.898(Ft/s)
Total irregular channel flow =   672.557(CFS)
Irregular channel normal depth above invert elev. =   3.950(Ft.)
Average velocity of channel(s) =   6.898(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.200 to Point/Station        4.200
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    329.309(Ac.)
Runoff from this stream =    672.557(CFS)
Time of concentration =   14.61 min.
Rainfall intensity =     4.618(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.100 to Point/Station        4.200
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  887.000(Ft.)
Highest elevation =  835.000(Ft.)
Lowest elevation =  656.000(Ft.)
Elevation difference =  179.000(Ft.) Slope = 20.180 %
Top of Initial Area Slope adjusted by User to 30.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  30.00 %, in a development type of
 Permanent Open Space
In Accordance With Table 3-2
Initial Area Time of Concentration =   6.90 minutes
```

```
 (for slope value of  10.00 %)
Rainfall intensity (I) =      7.492(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =     48.850(CFS)
Total initial stream area =       18.630(Ac.)


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Process from Point/Station        4.200 to Point/Station        4.200
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     18.630(Ac.)
Runoff from this stream =     48.850(CFS)
Time of concentration =    6.90 min.
Rainfall intensity =     7.492(In/Hr)


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Process from Point/Station      511.000 to Point/Station        4.200
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      6.312(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   9.00 min.  Rain intensity =       6.31(In/Hr)
Total area =        0.944(Ac.)  Total runoff =     3.650(CFS)


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Process from Point/Station        4.200 to Point/Station        4.200
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.944(Ac.)
Runoff from this stream =      3.650(CFS)
Time of concentration =    9.00 min.
Rainfall intensity =     6.312(In/Hr)
Summary of stream data:

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


1      672.557     14.61               4.618
2       48.850      6.90               7.492
3        3.650      9.00               6.312
Qmax(1) =
          1.000 *    1.000 *   672.557) +
          0.616 *    1.000 *    48.850) +
          0.732 *    1.000 *     3.650) + =     705.338
Qmax(2) =
          1.000 *    0.472 *   672.557) +
          1.000 *    1.000 *    48.850) +
          1.000 *    0.767 *     3.650) + =     369.286
Qmax(3) =
          1.000 *    0.616 *   672.557) +
          0.843 *    1.000 *    48.850) +
          1.000 *    1.000 *     3.650) + =     459.117

Total of 3 streams to confluence:
Flow rates before confluence point:
     672.557      48.850       3.650
Maximum flow rates at confluence using above data:
      705.338      369.286      459.117
Area of streams before confluence:
      329.309       18.630        0.944
```

```
Results of confluence:
Total flow rate =    705.338(CFS)
Time of concentration =    14.610 min.
Effective stream area after confluence =    348.883(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.200 to Point/Station        4.300
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Depth of flow =   4.839(Ft.), Average velocity =   4.819(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00             16.00
       2            100.00              0.00
       3            200.00             16.00
Manning's 'N' friction factor =   0.045
----------------------------------------------------------------
Sub-Channel flow  =    705.338(CFS)
  '     '       flow top width =     60.492(Ft.)
  '     '    velocity=    4.819(Ft/s)
  '     '       area =    146.372(Sq.Ft)
  '     '       Froude number =     0.546

Upstream point elevation =   656.000(Ft.)
Downstream point elevation =   654.000(Ft.)
Flow length =   300.000(Ft.)
Travel time  =    1.04 min.
Time of concentration =   15.65 min.
Depth of flow =   4.839(Ft.)
Average velocity =   4.819(Ft/s)
Total irregular channel flow =   705.338(CFS)
Irregular channel normal depth above invert elev. =   4.839(Ft.)
Average velocity of channel(s) =   4.819(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.300 to Point/Station        4.300
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    348.883(Ac.)
Runoff from this stream =    705.338(CFS)
Time of concentration =   15.65 min.
Rainfall intensity =     4.418(In/Hr)


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Process from Point/Station      523.000 to Point/Station        4.300
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      8.198(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   6.00 min.  Rain intensity =       8.20(In/Hr)
Total area =        0.860(Ac.)  Total runoff =     4.100(CFS)


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Process from Point/Station        4.300 to Point/Station        4.300
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.860(Ac.)
Runoff from this stream =      4.100(CFS)
```

```
Time of concentration =    6.00 min.
Rainfall intensity =     8.198(In/Hr)
Summary of stream data:

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


1      705.338     15.65               4.418
2        4.100      6.00               8.198
Qmax(1) =
          1.000 *    1.000 *   705.338) +
          0.539 *    1.000 *     4.100) + =     707.547
Qmax(2) =
          1.000 *    0.383 *   705.338) +
          1.000 *    1.000 *     4.100) + =     274.561

Total of 2 streams to confluence:
Flow rates before confluence point:
     705.338       4.100
Maximum flow rates at confluence using above data:
      707.547      274.561
Area of streams before confluence:
      348.883        0.860
Results of confluence:
Total flow rate =    707.547(CFS)
Time of concentration =    15.647 min.
Effective stream area after confluence =    349.743(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.300 to Point/Station      430.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   647.000(Ft.)
Downstream point/station elevation =   641.300(Ft.)
Pipe length  =    83.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   707.547(CFS)
Nearest computed pipe diameter  =     63.00(In.)
Calculated individual pipe flow  =   707.547(CFS)
Normal flow depth in pipe =   47.16(In.)
Flow top width inside pipe =   54.67(In.)
Critical depth could not be calculated.
Pipe flow velocity =     40.69(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    15.68 min.


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Process from Point/Station      430.000 to Point/Station      430.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    349.743(Ac.)
Runoff from this stream =    707.547(CFS)
Time of concentration =   15.68 min.
Rainfall intensity =     4.412(In/Hr)


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Process from Point/Station      434.000 to Point/Station      430.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      8.198(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   6.00 min.  Rain intensity =       8.20(In/Hr)
```

```
Total area =        1.850(Ac.)  Total runoff =     8.780(CFS)


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Process from Point/Station      430.000 to Point/Station      430.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.850(Ac.)
Runoff from this stream =      8.780(CFS)
Time of concentration =    6.00 min.
Rainfall intensity =     8.198(In/Hr)
Summary of stream data:

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


1      707.547     15.68               4.412
2        8.780      6.00               8.198
Qmax(1) =
          1.000 *    1.000 *   707.547) +
          0.538 *    1.000 *     8.780) + =     712.272
Qmax(2) =
          1.000 *    0.383 *   707.547) +
          1.000 *    1.000 *     8.780) + =     279.500

Total of 2 streams to confluence:
Flow rates before confluence point:
     707.547       8.780
Maximum flow rates at confluence using above data:
      712.272      279.500
Area of streams before confluence:
      349.743        1.850
Results of confluence:
Total flow rate =    712.272(CFS)
Time of concentration =    15.681 min.
Effective stream area after confluence =    351.593(Ac.)


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Process from Point/Station      430.000 to Point/Station        5.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Depth of flow =   0.355(Ft.), Average velocity =   3.337(Ft/s)
       ******* Irregular Channel Data ***********
-------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00             25.00
       2             60.00              0.00
       3            660.00              0.00
       4            720.00             20.00
Manning's 'N' friction factor =   0.045
-------------------------------------------------------------------
Sub-Channel flow  =    712.278(CFS)
  '     '       flow top width =    601.918(Ft.)
  '     '    velocity=    3.337(Ft/s)
  '     '       area =    213.424(Sq.Ft)
  '     '       Froude number =     0.988

Upstream point elevation =   641.300(Ft.)
Downstream point elevation =   631.000(Ft.)
Flow length =   253.000(Ft.)
Travel time  =    1.26 min.
Time of concentration =   16.94 min.
Depth of flow =   0.355(Ft.)
Average velocity =   3.337(Ft/s)
Total irregular channel flow =   712.272(CFS)
Irregular channel normal depth above invert elev. =   0.355(Ft.)
Average velocity of channel(s) =   3.337(Ft/s)


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Process from Point/Station        5.000 to Point/Station        5.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    351.593(Ac.)
Runoff from this stream =    712.272(CFS)
Time of concentration =   16.94 min.
Rainfall intensity =     4.197(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       82.000 to Point/Station        5.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
____________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      6.312(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   9.00 min.  Rain intensity =       6.31(In/Hr)
Total area =      103.820(Ac.)  Total runoff =   212.100(CFS)


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Process from Point/Station        5.000 to Point/Station        5.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =    103.820(Ac.)
Runoff from this stream =    212.100(CFS)
Time of concentration =    9.00 min.
Rainfall intensity =     6.312(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      648.000 to Point/Station        5.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
____________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      5.897(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  10.00 min.  Rain intensity =       5.90(In/Hr)
Total area =       15.310(Ac.)  Total runoff =    49.700(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        5.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =     15.310(Ac.)
Runoff from this stream =     49.700(CFS)
Time of concentration =   10.00 min.
Rainfall intensity =     5.897(In/Hr)
Summary of stream data:

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


1      712.272     16.94               4.197
2      212.100      9.00               6.312
```

```
3       49.700     10.00               5.897
Qmax(1) =
          1.000 *    1.000 *   712.272) +
          0.665 *    1.000 *   212.100) +
          0.712 *    1.000 *    49.700) + =     888.667
Qmax(2) =
          1.000 *    0.531 *   712.272) +
          1.000 *    1.000 *   212.100) +
          1.000 *    0.900 *    49.700) + =     635.141
Qmax(3) =
          1.000 *    0.590 *   712.272) +
          0.934 *    1.000 *   212.100) +
          1.000 *    1.000 *    49.700) + =     668.211

Total of 3 streams to confluence:
Flow rates before confluence point:
     712.272     212.100      49.700
Maximum flow rates at confluence using above data:
      888.667      635.141      668.211
Area of streams before confluence:
      351.593      103.820       15.310
Results of confluence:
Total flow rate =    888.667(CFS)
Time of concentration =    16.945 min.
Effective stream area after confluence =    470.723(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station      543.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Depth of flow =   0.420(Ft.), Average velocity =   3.524(Ft/s)
        ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00             25.00
        2             60.00              0.00
        3            660.00              0.00
        4            720.00             20.00
Manning's 'N' friction factor =   0.045
----------------------------------------------------------------
Sub-Channel flow  =    888.667(CFS)
  '     '       flow top width =    602.265(Ft.)
  '     '    velocity=    3.524(Ft/s)
  '     '       area =    252.185(Sq.Ft)
  '     '       Froude number =     0.960

Upstream point elevation =   631.000(Ft.)
Downstream point elevation =   627.000(Ft.)
Flow length =   110.000(Ft.)
Travel time  =    0.52 min.
Time of concentration =   17.47 min.
Depth of flow =   0.420(Ft.)
Average velocity =   3.524(Ft/s)
Total irregular channel flow =   888.667(CFS)
Irregular channel normal depth above invert elev. =   0.420(Ft.)
Average velocity of channel(s) =   3.524(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      543.000 to Point/Station      543.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    470.723(Ac.)
Runoff from this stream =    888.667(CFS)
Time of concentration =   17.47 min.
Rainfall intensity =     4.116(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      543.000 to Point/Station      543.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
```

```
____________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      7.423(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   7.00 min.  Rain intensity =       7.42(In/Hr)
Total area =        5.790(Ac.)  Total runoff =    20.100(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      543.000 to Point/Station      543.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      5.790(Ac.)
Runoff from this stream =     20.100(CFS)
Time of concentration =    7.00 min.
Rainfall intensity =     7.423(In/Hr)
Summary of stream data:

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


1      888.667     17.47               4.116
2       20.100      7.00               7.423
Qmax(1) =
          1.000 *    1.000 *   888.667) +
          0.554 *    1.000 *    20.100) + =     899.812
Qmax(2) =
          1.000 *    0.401 *   888.667) +
          1.000 *    1.000 *    20.100) + =     376.276

Total of 2 streams to confluence:
Flow rates before confluence point:
     888.667      20.100
Maximum flow rates at confluence using above data:
      899.812      376.276
Area of streams before confluence:
      470.723        5.790
Results of confluence:
Total flow rate =    899.812(CFS)
Time of concentration =    17.465 min.
Effective stream area after confluence =    476.513(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      543.000 to Point/Station        5.100
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
____________________________________________________________________
Depth of flow =   5.232(Ft.), Average velocity =   9.745(Ft/s)
       ******* Irregular Channel Data ***********
-------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00             24.00
       2             85.00              0.00
       3            226.00             44.00
Manning's 'N' friction factor =   0.045
-------------------------------------------------------------------
Sub-Channel flow  =    899.812(CFS)
  '     '       flow top width =     35.297(Ft.)
  '     '    velocity=    9.745(Ft/s)
  '     '       area =     92.340(Sq.Ft)
  '     '       Froude number =     1.062

Upstream point elevation =   627.000(Ft.)
Downstream point elevation =   604.000(Ft.)
```

```
Flow length =   900.000(Ft.)
Travel time  =    1.54 min.
Time of concentration =   19.00 min.
Depth of flow =   5.232(Ft.)
Average velocity =   9.745(Ft/s)
Total irregular channel flow =   899.812(CFS)
Irregular channel normal depth above invert elev. =   5.232(Ft.)
Average velocity of channel(s) =   9.745(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.100 to Point/Station        5.100
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    476.513(Ac.)
Runoff from this stream =    899.812(CFS)
Time of concentration =   19.00 min.
Rainfall intensity =     3.897(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      243.000 to Point/Station        5.100
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      6.312(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   9.00 min.  Rain intensity =       6.31(In/Hr)
Total area =        8.280(Ac.)  Total runoff =    24.200(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.100 to Point/Station        5.100
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      8.280(Ac.)
Runoff from this stream =     24.200(CFS)
Time of concentration =    9.00 min.
Rainfall intensity =     6.312(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      552.000 to Point/Station        5.100
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      7.423(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   7.00 min.  Rain intensity =       7.42(In/Hr)
Total area =        4.450(Ac.)  Total runoff =    13.800(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.100 to Point/Station        5.100
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      4.450(Ac.)
```

```
Runoff from this stream =     13.800(CFS)
Time of concentration =    7.00 min.
Rainfall intensity =     7.423(In/Hr)
Summary of stream data:

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


1      899.812     19.00               3.897
2       24.200      9.00               6.312
3       13.800      7.00               7.423
Qmax(1) =
          1.000 *    1.000 *   899.812) +
          0.617 *    1.000 *    24.200) +
          0.525 *    1.000 *    13.800) + =     922.001
Qmax(2) =
          1.000 *    0.474 *   899.812) +
          1.000 *    1.000 *    24.200) +
          0.850 *    1.000 *    13.800) + =     462.061
Qmax(3) =
          1.000 *    0.368 *   899.812) +
          1.000 *    0.778 *    24.200) +
          1.000 *    1.000 *    13.800) + =     364.053

Total of 3 streams to confluence:
Flow rates before confluence point:
     899.812      24.200      13.800
Maximum flow rates at confluence using above data:
      922.001      462.061      364.053
Area of streams before confluence:
      476.513        8.280        4.450
Results of confluence:
Total flow rate =    922.001(CFS)
Time of concentration =    19.004 min.
Effective stream area after confluence =    489.243(Ac.)


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Process from Point/Station        5.100 to Point/Station        5.200
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Depth of flow =   5.072(Ft.), Average velocity =  10.624(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00             24.00
       2             85.00              0.00
       3            226.00             44.00
Manning's 'N' friction factor =   0.045
----------------------------------------------------------------
Sub-Channel flow  =    922.001(CFS)
  '     '       flow top width =     34.218(Ft.)
  '     '    velocity=   10.624(Ft/s)
  '     '       area =     86.782(Sq.Ft)
  '     '       Froude number =     1.176

Upstream point elevation =   604.000(Ft.)
Downstream point elevation =   592.000(Ft.)
Flow length =   379.000(Ft.)
Travel time  =    0.59 min.
Time of concentration =   19.60 min.
Depth of flow =   5.072(Ft.)
Average velocity =  10.624(Ft/s)
Total irregular channel flow =   922.001(CFS)
Irregular channel normal depth above invert elev. =   5.072(Ft.)
Average velocity of channel(s) =  10.624(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.200 to Point/Station        5.200
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
```

```
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    489.243(Ac.)
Runoff from this stream =    922.001(CFS)
Time of concentration =   19.60 min.
Rainfall intensity =     3.821(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      559.000 to Point/Station        5.200
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      7.423(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   7.00 min.  Rain intensity =       7.42(In/Hr)
Total area =        4.620(Ac.)  Total runoff =    13.000(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.200 to Point/Station        5.200
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      4.620(Ac.)
Runoff from this stream =     13.000(CFS)
Time of concentration =    7.00 min.
Rainfall intensity =     7.423(In/Hr)
Summary of stream data:

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


1      922.001     19.60               3.821
2       13.000      7.00               7.423
Qmax(1) =
           1.000 *    1.000 *   922.001) +
           0.515 *    1.000 *    13.000) + =     928.693
Qmax(2) =
           1.000 *    0.357 *   922.001) +
           1.000 *    1.000 *    13.000) + =     342.302

Total of 2 streams to confluence:
Flow rates before confluence point:
     922.001      13.000
Maximum flow rates at confluence using above data:
      928.693      342.302
Area of streams before confluence:
      489.243        4.620
Results of confluence:
Total flow rate =    928.693(CFS)
Time of concentration =    19.599 min.
Effective stream area after confluence =    493.863(Ac.)
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Process from Point/Station        5.200 to Point/Station        6.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =    948.916(CFS)
Depth of flow =   5.649(Ft.), Average velocity =   8.817(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00             24.00
       2             85.00              0.00
       3            226.00             44.00
Manning's 'N' friction factor =   0.045
----------------------------------------------------------------
Sub-Channel flow  =    948.916(CFS)
  '     '       flow top width =     38.107(Ft.)
  '     '    velocity=    8.817(Ft/s)
  '     '       area =    107.629(Sq.Ft)
  '     '       Froude number =     0.925

Upstream point elevation =   592.000(Ft.)
Downstream point elevation =   575.000(Ft.)
Flow length =   900.000(Ft.)
Travel time  =    1.70 min.
Time of concentration =   21.30 min.
Depth of flow =   5.649(Ft.)
Average velocity =   8.817(Ft/s)
Total irregular channel flow =   948.916(CFS)
Irregular channel normal depth above invert elev. =   5.649(Ft.)
Average velocity of channel(s) =   8.817(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                     ]
(2.0 DU/A or Less       )
Impervious value, Ai = 0.200
Sub-Area C Value = 0.460
Rainfall intensity =      3.621(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.463  CA =    267.626
Subarea runoff =     40.386(CFS) for     83.770(Ac.)
Total runoff =    969.079(CFS)        Total area =     577.633(Ac.)
Depth of flow =   5.693(Ft.), Average velocity =   8.863(Ft/s)
End of computations, total study area =         577.633 (Ac.)
```

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2004 Version 7.4

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
       Rational Hydrology Study        Date: 02/18/13
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

File: 12052POSTB.RD3
------------------------------------------------------------------------
Program License Serial Number 4012
------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       31.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   92.000(Ft.)
Highest elevation =  706.000(Ft.)
Lowest elevation =  703.000(Ft.)
Elevation difference =    3.000(Ft.) Slope =  3.261 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   3.26 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.76 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  90.000^.5)/(   3.261^(1/3)]=   5.76
Rainfall intensity (I) =      8.419(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.364(CFS)
Total initial stream area =        0.072(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.000 to Point/Station       32.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   698.500(Ft.)
Downstream point/station elevation =   693.300(Ft.)
Pipe length  =    85.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.364(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.364(CFS)
Normal flow depth in pipe =    2.10(In.)
Flow top width inside pipe =    5.72(In.)
Critical Depth =    3.68(In.)
Pipe flow velocity =      5.95(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =     6.00 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.000 to Point/Station       32.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.00 min.
Rainfall intensity =      8.202(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.097
Subarea runoff =      0.434(CFS) for      0.090(Ac.)
Total runoff =      0.797(CFS)        Total area =       0.162(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.000 to Point/Station       33.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   693.300(Ft.)
Downstream point/station elevation =   691.300(Ft.)
Pipe length  =    85.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.797(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.797(CFS)
Normal flow depth in pipe =    4.56(In.)
Flow top width inside pipe =    5.13(In.)
Critical Depth =    5.32(In.)
Pipe flow velocity =      4.98(Ft/s)
Travel time through pipe =    0.28 min.
Time of concentration (TC) =     6.28 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       33.000 to Point/Station       33.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.28 min.
Rainfall intensity =      7.961(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.136
Subarea runoff =      0.287(CFS) for      0.065(Ac.)
Total runoff =      1.084(CFS)        Total area =       0.227(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       33.000 to Point/Station       34.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   691.300(Ft.)
Downstream point/station elevation =   690.800(Ft.)
Pipe length  =    43.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.084(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.084(CFS)
Normal flow depth in pipe =    5.06(In.)
Flow top width inside pipe =    8.93(In.)
Critical Depth =    5.74(In.)
Pipe flow velocity =      4.23(Ft/s)
Travel time through pipe =    0.17 min.
Time of concentration (TC) =     6.45 min.
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       34.000 to Point/Station       34.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.45 min.
Rainfall intensity =      7.825(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.159
Subarea runoff =      0.160(CFS) for      0.038(Ac.)
Total runoff =      1.244(CFS)        Total area =       0.265(Ac.)


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Process from Point/Station       34.000 to Point/Station       39.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   690.800(Ft.)
Downstream point/station elevation =   688.000(Ft.)
Pipe length  =     3.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.244(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.244(CFS)
Normal flow depth in pipe =    1.96(In.)
Flow top width inside pipe =    5.62(In.)
Critical depth could not be calculated.
Pipe flow velocity =     22.41(Ft/s)
Travel time through pipe =    0.00 min.
Time of concentration (TC) =     6.45 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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 =      0.265(Ac.)
Runoff from this stream =      1.244(CFS)
Time of concentration =    6.45 min.
Rainfall intensity =     7.823(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.100 to Point/Station       35.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   96.000(Ft.)
Highest elevation =  706.000(Ft.)
Lowest elevation =  703.000(Ft.)
Elevation difference =    3.000(Ft.) Slope =  3.125 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   3.13 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.84 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
```

```
TC = [1.8*(1.1-0.6000)*(  90.000^.5)/(   3.125^(1/3)]=   5.84
Rainfall intensity (I) =      8.343(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.365(CFS)
Total initial stream area =        0.073(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       35.000 to Point/Station       36.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   698.500(Ft.)
Downstream point/station elevation =   695.000(Ft.)
Pipe length  =    88.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.365(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.365(CFS)
Normal flow depth in pipe =    2.36(In.)
Flow top width inside pipe =    5.86(In.)
Critical Depth =    3.68(In.)
Pipe flow velocity =      5.10(Ft/s)
Travel time through pipe =    0.29 min.
Time of concentration (TC) =     6.13 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       36.000 to Point/Station       36.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.13 min.
Rainfall intensity =      8.088(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.085
Subarea runoff =      0.319(CFS) for      0.068(Ac.)
Total runoff =      0.684(CFS)        Total area =       0.141(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       36.000 to Point/Station       37.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   695.000(Ft.)
Downstream point/station elevation =   691.300(Ft.)
Pipe length  =    84.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.684(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.684(CFS)
Normal flow depth in pipe =    3.28(In.)
Flow top width inside pipe =    5.97(In.)
Critical Depth =    5.02(In.)
Pipe flow velocity =      6.22(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =     6.35 min.


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Process from Point/Station       37.000 to Point/Station       37.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
```

```
Sub-Area C Value = 0.600
Time of concentration =     6.35 min.
Rainfall intensity =      7.902(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.121
Subarea runoff =      0.273(CFS) for      0.061(Ac.)
Total runoff =      0.958(CFS)        Total area =       0.202(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       37.000 to Point/Station       38.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   691.300(Ft.)
Downstream point/station elevation =   689.300(Ft.)
Pipe length  =    84.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.958(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.958(CFS)
Normal flow depth in pipe =    3.82(In.)
Flow top width inside pipe =    8.90(In.)
Critical Depth =    5.38(In.)
Pipe flow velocity =      5.37(Ft/s)
Travel time through pipe =    0.26 min.
Time of concentration (TC) =     6.61 min.


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Process from Point/Station       38.000 to Point/Station       38.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.61 min.
Rainfall intensity =      7.699(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.145
Subarea runoff =      0.160(CFS) for      0.040(Ac.)
Total runoff =      1.118(CFS)        Total area =       0.242(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       38.000 to Point/Station       39.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   689.300(Ft.)
Downstream point/station elevation =   688.000(Ft.)
Pipe length  =    33.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.118(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.118(CFS)
Normal flow depth in pipe =    3.62(In.)
Flow top width inside pipe =    8.83(In.)
Critical Depth =    5.83(In.)
Pipe flow velocity =      6.72(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =     6.70 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       39.000 to Point/Station       39.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.242(Ac.)
Runoff from this stream =      1.118(CFS)
Time of concentration =    6.70 min.
Rainfall intensity =     7.639(In/Hr)
```

```
Summary of stream data:

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


1        1.244      6.45               7.823
2        1.118      6.70               7.639
Qmax(1) =
          1.000 *    1.000 *     1.244) +
          1.000 *    0.964 *     1.118) + =       2.321
Qmax(2) =
          0.976 *    1.000 *     1.244) +
          1.000 *    1.000 *     1.118) + =       2.333

Total of 2 streams to confluence:
Flow rates before confluence point:
       1.244       1.118
Maximum flow rates at confluence using above data:
        2.321        2.333
Area of streams before confluence:
        0.265        0.242
Results of confluence:
Total flow rate =      2.333(CFS)
Time of concentration =     6.695 min.
Effective stream area after confluence =      0.507(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       39.000 to Point/Station      130.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   688.000(Ft.)
Downstream point/station elevation =   685.700(Ft.)
Pipe length  =   128.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.333(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.333(CFS)
Normal flow depth in pipe =    5.92(In.)
Flow top width inside pipe =   12.00(In.)
Critical Depth =    7.85(In.)
Pipe flow velocity =      6.05(Ft/s)
Travel time through pipe =    0.35 min.
Time of concentration (TC) =     7.05 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      130.000 to Point/Station      130.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.507(Ac.)
Runoff from this stream =      2.333(CFS)
Time of concentration =    7.05 min.
Rainfall intensity =     7.390(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      139.000 to Point/Station      139.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      6.312(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   9.00 min.  Rain intensity =       6.31(In/Hr)
Total area =        1.640(Ac.)  Total runoff =     6.100(CFS)
```

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Process from Point/Station      139.000 to Point/Station      130.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   689.900(Ft.)
Downstream point/station elevation =   685.700(Ft.)
Pipe length  =    75.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.100(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     6.100(CFS)
Normal flow depth in pipe =    7.56(In.)
Flow top width inside pipe =   11.58(In.)
Critical depth could not be calculated.
Pipe flow velocity =     11.70(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =     9.11 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      130.000 to Point/Station      130.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.640(Ac.)
Runoff from this stream =      6.100(CFS)
Time of concentration =    9.11 min.
Rainfall intensity =     6.264(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      129.000 to Point/Station      129.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      6.312(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   9.00 min.  Rain intensity =       6.31(In/Hr)
Total area =        1.340(Ac.)  Total runoff =     5.000(CFS)


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Process from Point/Station      129.000 to Point/Station      130.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   687.000(Ft.)
Downstream point/station elevation =   685.700(Ft.)
Pipe length  =   123.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.000(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     5.000(CFS)
Normal flow depth in pipe =    9.71(In.)
Flow top width inside pipe =   14.33(In.)
Critical Depth =   10.89(In.)
Pipe flow velocity =      5.94(Ft/s)
Travel time through pipe =    0.34 min.
Time of concentration (TC) =     9.34 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      130.000 to Point/Station      130.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      1.340(Ac.)
Runoff from this stream =      5.000(CFS)
Time of concentration =    9.34 min.
```

```
Rainfall intensity =     6.161(In/Hr)
Summary of stream data:

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


1        2.333      7.05               7.390
2        6.100      9.11               6.264
3        5.000      9.34               6.161
Qmax(1) =
          1.000 *    1.000 *     2.333) +
          1.000 *    0.774 *     6.100) +
          1.000 *    0.754 *     5.000) + =      10.825
Qmax(2) =
          0.848 *    1.000 *     2.333) +
          1.000 *    1.000 *     6.100) +
          1.000 *    0.975 *     5.000) + =      12.950
Qmax(3) =
          0.834 *    1.000 *     2.333) +
          0.983 *    1.000 *     6.100) +
          1.000 *    1.000 *     5.000) + =      12.944

Total of 3 streams to confluence:
Flow rates before confluence point:
       2.333       6.100       5.000
Maximum flow rates at confluence using above data:
       10.825       12.950       12.944
Area of streams before confluence:
        0.507        1.640        1.340
Results of confluence:
Total flow rate =     12.950(CFS)
Time of concentration =     9.107 min.
Effective stream area after confluence =      3.487(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      130.000 to Point/Station       42.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   685.700(Ft.)
Downstream point/station elevation =   684.700(Ft.)
Pipe length  =    92.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.950(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    12.950(CFS)
Normal flow depth in pipe =   13.99(In.)
Flow top width inside pipe =   19.80(In.)
Critical Depth =   16.08(In.)
Pipe flow velocity =      7.60(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =     9.31 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       42.000 to Point/Station       42.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.487(Ac.)
Runoff from this stream =     12.950(CFS)
Time of concentration =    9.31 min.
Rainfall intensity =     6.176(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       34.000 to Point/Station       40.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
```

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(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  220.000(Ft.)
Highest elevation =  696.000(Ft.)
Lowest elevation =  690.000(Ft.)
Elevation difference =    6.000(Ft.) Slope =  2.727 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   2.73 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.11 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  90.000^.5)/(   2.727^(1/3)]=   6.11
Rainfall intensity (I) =      8.102(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.841(CFS)
Total initial stream area =        0.173(Ac.)


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Process from Point/Station       40.000 to Point/Station       42.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   685.500(Ft.)
Downstream point/station elevation =   684.700(Ft.)
Pipe length  =    12.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.841(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.841(CFS)
Normal flow depth in pipe =    3.28(In.)
Flow top width inside pipe =    5.97(In.)
Critical Depth =    5.42(In.)
Pipe flow velocity =      7.65(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     6.14 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       42.000 to Point/Station       42.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.173(Ac.)
Runoff from this stream =      0.841(CFS)
Time of concentration =    6.14 min.
Rainfall intensity =     8.080(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       38.000 to Point/Station       41.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  241.000(Ft.)
Highest elevation =  696.000(Ft.)
Lowest elevation =  690.000(Ft.)
Elevation difference =    6.000(Ft.) Slope =  2.490 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 80.00 (Ft)
for the top area slope value of   2.49 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.94 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  80.000^.5)/(   2.490^(1/3)]=   5.94
```

```
Rainfall intensity (I) =      8.253(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.867(CFS)
Total initial stream area =        0.175(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       41.000 to Point/Station       42.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   685.500(Ft.)
Downstream point/station elevation =   684.700(Ft.)
Pipe length  =    38.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.867(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.867(CFS)
Normal flow depth in pipe =    3.74(In.)
Flow top width inside pipe =    8.87(In.)
Critical Depth =    5.11(In.)
Pipe flow velocity =      4.99(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =     6.07 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       42.000 to Point/Station       42.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.175(Ac.)
Runoff from this stream =      0.867(CFS)
Time of concentration =    6.07 min.
Rainfall intensity =     8.141(In/Hr)
Summary of stream data:

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


1       12.950      9.31               6.176
2        0.841      6.14               8.080
3        0.867      6.07               8.141
Qmax(1) =
          1.000 *    1.000 *    12.950) +
          0.764 *    1.000 *     0.841) +
          0.759 *    1.000 *     0.867) + =      14.250
Qmax(2) =
          1.000 *    0.659 *    12.950) +
          1.000 *    1.000 *     0.841) +
          0.992 *    1.000 *     0.867) + =      10.239
Qmax(3) =
          1.000 *    0.652 *    12.950) +
          1.000 *    0.988 *     0.841) +
          1.000 *    1.000 *     0.867) + =      10.137

Total of 3 streams to confluence:
Flow rates before confluence point:
      12.950       0.841       0.867
Maximum flow rates at confluence using above data:
       14.250       10.239       10.137
Area of streams before confluence:
        3.487        0.173        0.175
Results of confluence:
Total flow rate =     14.250(CFS)
Time of concentration =     9.309 min.
Effective stream area after confluence =      3.835(Ac.)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       42.000 to Point/Station       43.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   684.700(Ft.)
Downstream point/station elevation =   684.000(Ft.)
Pipe length  =    52.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.250(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    14.250(CFS)
Normal flow depth in pipe =   13.89(In.)
Flow top width inside pipe =   19.88(In.)
Critical Depth =   16.82(In.)
Pipe flow velocity =      8.44(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     9.41 min.
End of computations, total study area =           3.835 (Ac.)
```

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                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2004 Version 7.4

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
       Rational Hydrology Study        Date: 01/31/13
----------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

----------------------------------------------------------------------
FILE: 12052WQE.RD3

Program License Serial Number 4012

----------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      123.000 to Point/Station      124.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   99.890(Ft.)
Highest elevation =  707.500(Ft.)
Lowest elevation =  706.500(Ft.)
Elevation difference =    1.000(Ft.) Slope =  1.001 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 65.00 (Ft)
for the top area slope value of   1.00 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.25 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  65.000^.5)/(   1.001^(1/3)]=   7.25
Rainfall intensity (I) =      7.254(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.514(CFS)
Total initial stream area =        0.118(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      124.000 to Point/Station      125.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   704.500(Ft.)
Downstream point/station elevation =   702.000(Ft.)
Pipe length  =   125.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.514(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.514(CFS)
Normal flow depth in pipe =    3.52(In.)
Flow top width inside pipe =    5.91(In.)
Critical Depth =    4.38(In.)
Pipe flow velocity =      4.30(Ft/s)
```

Flow rate for Pond E

```
Travel time through pipe =    0.48 min.
Time of concentration (TC) =     7.74 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      125.000 to Point/Station      125.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     7.74 min.
Rainfall intensity =      6.958(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.268
Subarea runoff =      1.352(CFS) for      0.329(Ac.)
Total runoff =      1.866(CFS)        Total area =       0.447(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      125.000 to Point/Station      126.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   702.000(Ft.)
Downstream point/station elevation =   696.600(Ft.)
Pipe length  =   172.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.866(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.866(CFS)
Normal flow depth in pipe =    5.21(In.)
Flow top width inside pipe =    8.89(In.)
Critical Depth =    7.49(In.)
Pipe flow velocity =      7.03(Ft/s)
Travel time through pipe =    0.41 min.
Time of concentration (TC) =     8.15 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      126.000 to Point/Station      126.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.15 min.
Rainfall intensity =      6.731(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.499
Subarea runoff =      1.490(CFS) for      0.384(Ac.)
Total runoff =      3.356(CFS)        Total area =       0.831(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      126.000 to Point/Station      127.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   696.600(Ft.)
Downstream point/station elevation =   691.500(Ft.)
Pipe length  =   157.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.356(CFS)
Nearest computed pipe diameter  =     12.00(In.)
```

```
Calculated individual pipe flow  =     3.356(CFS)
Normal flow depth in pipe =    6.16(In.)
Flow top width inside pipe =   12.00(In.)
Critical Depth =    9.40(In.)
Pipe flow velocity =      8.27(Ft/s)
Travel time through pipe =    0.32 min.
Time of concentration (TC) =     8.46 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      127.000 to Point/Station      127.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.46 min.
Rainfall intensity =      6.568(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.754
Subarea runoff =      1.593(CFS) for      0.425(Ac.)
Total runoff =      4.949(CFS)        Total area =       1.256(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      127.000 to Point/Station      128.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   691.500(Ft.)
Downstream point/station elevation =   691.000(Ft.)
Pipe length  =    34.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.949(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     4.949(CFS)
Normal flow depth in pipe =    8.65(In.)
Flow top width inside pipe =   14.82(In.)
Critical Depth =   10.82(In.)
Pipe flow velocity =      6.75(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =     8.55 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      128.000 to Point/Station      129.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      5.004(CFS)
Depth of flow =   0.173(Ft.), Average velocity =   1.421(Ft/s)
       ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              2.50
       2              5.00              0.00
       3             25.00              0.00
       4             30.00              2.50
Manning's 'N' friction factor =   0.030
-----------------------------------------------------------------
Sub-Channel flow  =      5.004(CFS)
  '     '       flow top width =     20.692(Ft.)
  '     '    velocity=    1.421(Ft/s)
  '     '       area =      3.521(Sq.Ft)
  '     '       Froude number =     0.607

Upstream point elevation =   691.000(Ft.)
Downstream point elevation =   690.500(Ft.)
```

```
Flow length =    57.000(Ft.)
Travel time  =    0.67 min.
Time of concentration =    9.22 min.
Depth of flow =   0.173(Ft.)
Average velocity =   1.421(Ft/s)
Total irregular channel flow =     5.004(CFS)
Irregular channel normal depth above invert elev. =   0.173(Ft.)
Average velocity of channel(s) =   1.421(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity =      6.216(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.802
Subarea runoff =      0.038(CFS) for      0.081(Ac.)
Total runoff =      4.987(CFS)        Total area =       1.337(Ac.)
Depth of flow =   0.173(Ft.), Average velocity =   1.419(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      129.000 to Point/Station      130.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   690.500(Ft.)
Downstream point/station elevation =   689.000(Ft.)
Pipe length  =   134.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.987(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     4.987(CFS)
Normal flow depth in pipe =    9.52(In.)
Flow top width inside pipe =   14.45(In.)
Critical Depth =   10.86(In.)
Pipe flow velocity =      6.08(Ft/s)
Travel time through pipe =    0.37 min.
Time of concentration (TC) =     9.58 min.
End of computations, total study area =           1.337 (Ac.)
```

# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

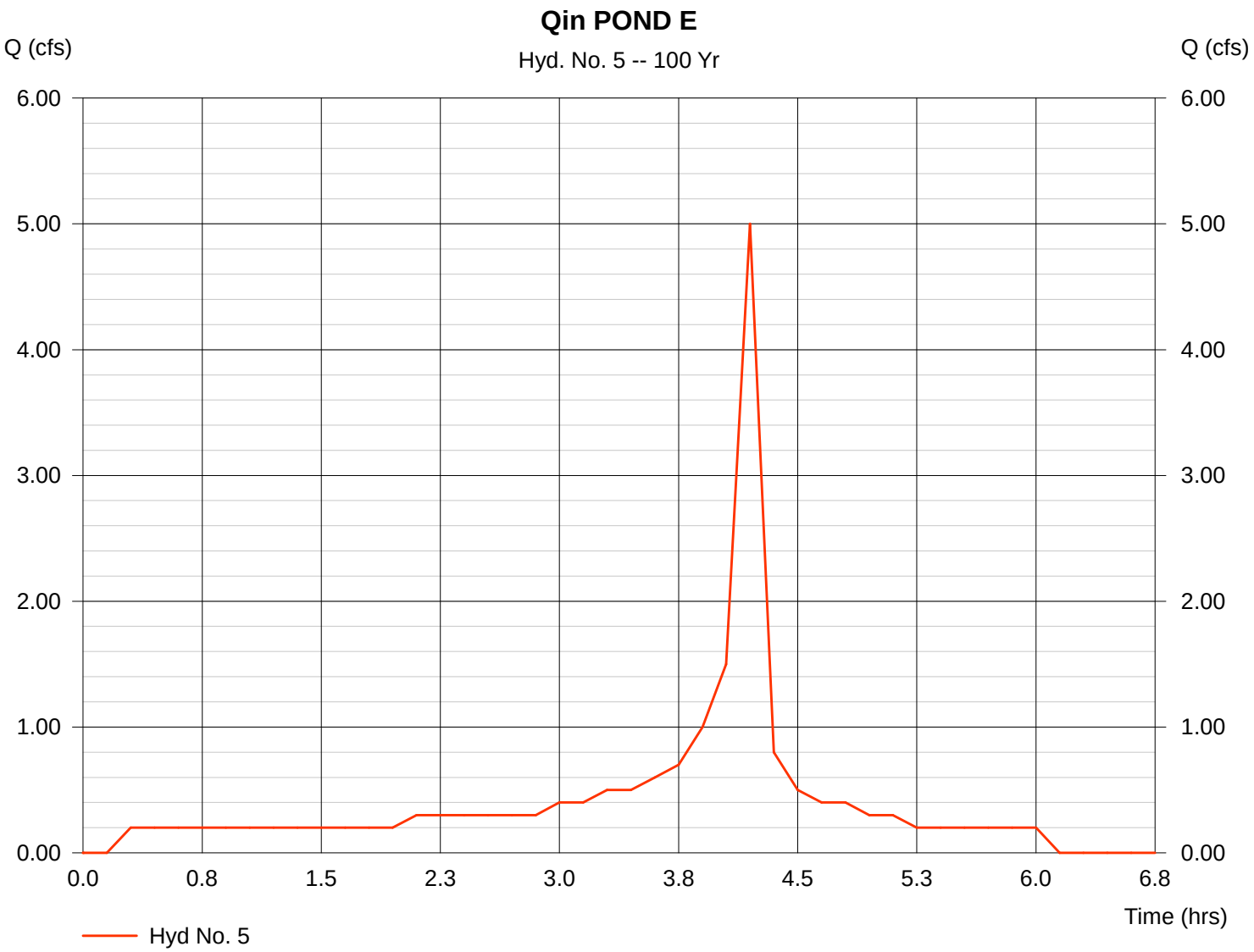
Monday, Jul 22 2013, 8:37 AM

## Hyd. No. 5

Qin POND E

| | | | |
|---|---|---|---|
| Hydrograph type | = Manual | Peak discharge | = 5.00 cfs |
| Storm frequency | = 100 yrs | Time interval | = 9 min |

Hydrograph Volume = 10,098 cuft



# Hydrograph Plot

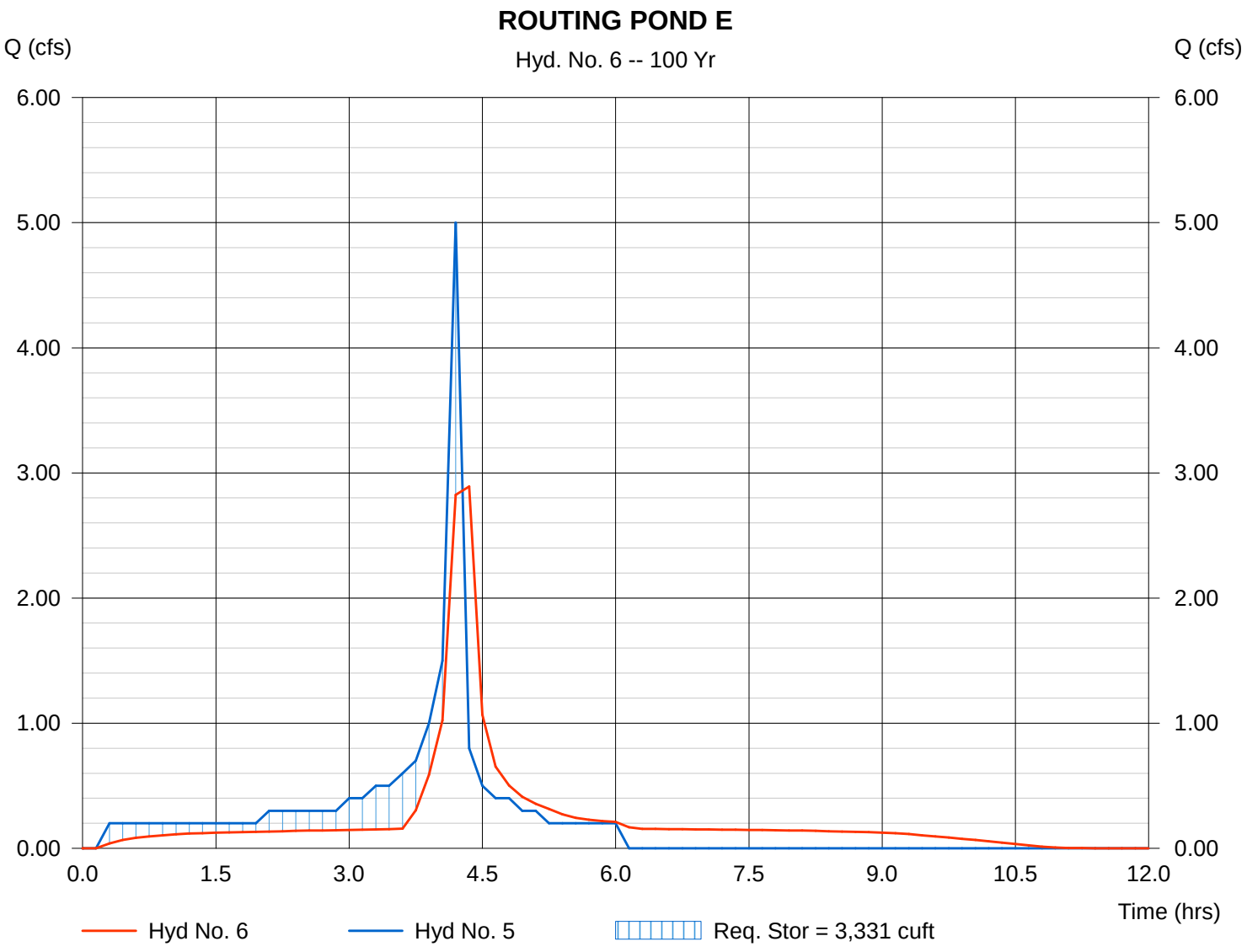
Hydraflow Hydrographs by Intelisolve | Monday, Jul 22 2013, 8:43 AM

## Hyd. No. 6

ROUTING POND E

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph type | = | Reservoir | Peak discharge | = | 2.89 cfs |
| Storm frequency | = | 100 yrs | Time interval | = | 9 min |
| Inflow hyd. No. | = | 5 | Max. Elevation | = | 692.55 ft |
| Reservoir name | = | POND E - STREET B | Max. Storage | = | 3,331 cuft |

Storage Indication method used. | Hydrograph Volume = 10,097 cuft



# Pond Report

Hydraflow Hydrographs by Intelisolve — Monday, Jul 22 2013, 8:57 AM

## Pond No. 4 - POND E - STREET B

### Pond Data

Pond storage is based on known values

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|---|---|---|---|---|
| 0.00 | 687.00 | 00 | 0 | 0 |
| 2.00 | 689.00 | 00 | 179 | 179 |
| 4.00 | 691.00 | 00 | 205 | 384 |
| 4.50 | 691.50 | 00 | 547 | 931 |
| 5.00 | 692.00 | 00 | 1,033 | 1,964 |
| 6.00 | 693.00 | 00 | 2,484 | 4,448 |
| 6.50 | 693.50 | 00 | 1,457 | 5,905 |

### Culvert / Orifice Structures

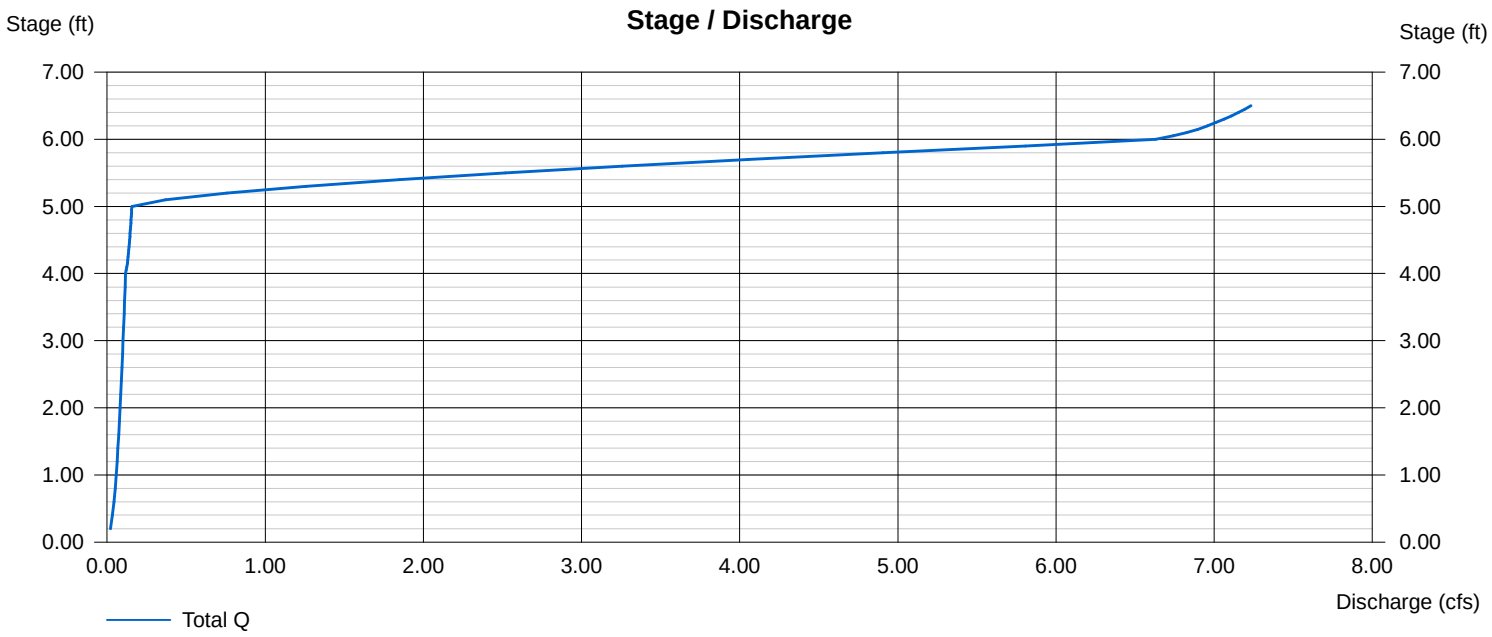
| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| **Rise (in)** | = 12.00 | 1.50 | 1.00 | 0.00 |
| **Span (in)** | = 12.00 | 1.50 | 1.00 | 0.00 |
| **No. Barrels** | = 1 | 1 | 1 | 0 |
| **Invert El. (ft)** | = 686.50 | 687.00 | 691.00 | 0.00 |
| **Length (ft)** | = 122.00 | 0.00 | 0.00 | 0.00 |
| **Slope (%)** | = 1.00 | 0.00 | 0.00 | 0.00 |
| **N-Value** | = .013 | .013 | .013 | .000 |
| **Orif. Coeff.** | = 0.60 | 0.60 | 0.60 | 0.00 |
| **Multi-Stage** | = n/a | Yes | Yes | No |

### Weir Structures

| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| **Crest Len (ft)** | = 2.00 | 0.00 | 0.00 | 0.00 |
| **Crest El. (ft)** | = 692.00 | 0.00 | 0.00 | 0.00 |
| **Weir Coeff.** | = 3.33 | 0.00 | 0.00 | 0.00 |
| **Weir Type** | = Riser | --- | --- | --- |
| **Multi-Stage** | = Yes | No | No | No |

**Exfiltration =** 0.000 in/hr (Wet area) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2004 Version 7.4

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
       Rational Hydrology Study        Date: 01/31/13
----------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

----------------------------------------------------------------------
File: 12052WQF.rd

Program License Serial Number 4012

----------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      131.000 to Point/Station      132.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  138.000(Ft.)
Highest elevation =  717.000(Ft.)
Lowest elevation =  716.000(Ft.)
Elevation difference =    1.000(Ft.) Slope =  0.725 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 50.00 (Ft)
for the top area slope value of   0.72 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.08 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  50.000^.5)/(   0.725^(1/3)]=   7.08
Rainfall intensity (I) =      7.366(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.742(CFS)
Total initial stream area =        0.168(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      132.000 to Point/Station      133.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   714.000(Ft.)
Downstream point/station elevation =   712.000(Ft.)
Pipe length  =   135.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.742(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.742(CFS)
Normal flow depth in pipe =    3.79(In.)
Flow top width inside pipe =    8.89(In.)
Critical Depth =    4.71(In.)
Pipe flow velocity =      4.21(Ft/s)
Travel time through pipe =    0.53 min.
Time of concentration (TC) =     7.62 min.
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      133.000 to Point/Station      133.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     7.62 min.
Rainfall intensity =      7.028(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.218
Subarea runoff =      0.793(CFS) for      0.196(Ac.)
Total runoff =      1.535(CFS)        Total area =       0.364(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      133.000 to Point/Station      134.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   712.000(Ft.)
Downstream point/station elevation =   709.400(Ft.)
Pipe length  =    85.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.535(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.535(CFS)
Normal flow depth in pipe =    4.66(In.)
Flow top width inside pipe =    8.99(In.)
Critical Depth =    6.84(In.)
Pipe flow velocity =      6.65(Ft/s)
Travel time through pipe =    0.21 min.
Time of concentration (TC) =     7.83 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      134.000 to Point/Station      134.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     7.83 min.
Rainfall intensity =      6.904(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.380
Subarea runoff =      1.091(CFS) for      0.270(Ac.)
Total runoff =      2.626(CFS)        Total area =       0.634(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      134.000 to Point/Station      135.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   709.400(Ft.)
Downstream point/station elevation =   701.500(Ft.)
Pipe length  =   152.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.626(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.626(CFS)
Normal flow depth in pipe =    5.53(In.)
Flow top width inside pipe =    8.76(In.)
Critical Depth =    8.42(In.)
```

```
Pipe flow velocity =      9.23(Ft/s)
Travel time through pipe =    0.27 min.
Time of concentration (TC) =     8.11 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      135.000 to Point/Station      135.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.11 min.
Rainfall intensity =      6.753(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.477
Subarea runoff =      0.595(CFS) for      0.161(Ac.)
Total runoff =      3.221(CFS)        Total area =       0.795(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      135.000 to Point/Station      136.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   701.500(Ft.)
Downstream point/station elevation =   699.600(Ft.)
Pipe length  =   154.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.221(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     3.221(CFS)
Normal flow depth in pipe =    8.23(In.)
Flow top width inside pipe =   11.14(In.)
Critical Depth =    9.23(In.)
Pipe flow velocity =      5.62(Ft/s)
Travel time through pipe =    0.46 min.
Time of concentration (TC) =     8.56 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      136.000 to Point/Station      136.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.56 min.
Rainfall intensity =      6.518(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.701
Subarea runoff =      1.347(CFS) for      0.373(Ac.)
Total runoff =      4.568(CFS)        Total area =       1.168(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      136.000 to Point/Station      137.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   699.600(Ft.)
Downstream point/station elevation =   694.400(Ft.)
Pipe length  =   130.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.568(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     4.568(CFS)
```

```
Normal flow depth in pipe =    6.98(In.)
Flow top width inside pipe =   11.84(In.)
Critical Depth =   10.70(In.)
Pipe flow velocity =      9.63(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =     8.79 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      137.000 to Point/Station      137.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.79 min.
Rainfall intensity =      6.410(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.932
Subarea runoff =      1.409(CFS) for      0.386(Ac.)
Total runoff =      5.976(CFS)        Total area =       1.554(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      137.000 to Point/Station      138.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   694.400(Ft.)
Downstream point/station elevation =   694.200(Ft.)
Pipe length  =     9.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.976(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     5.976(CFS)
Normal flow depth in pipe =    8.55(In.)
Flow top width inside pipe =   14.85(In.)
Critical Depth =   11.87(In.)
Pipe flow velocity =      8.27(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =     8.81 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      138.000 to Point/Station      139.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      6.088(CFS)
Depth of flow =   0.166(Ft.), Average velocity =   1.210(Ft/s)
       ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              2.50
       2              5.00              0.00
       3             35.00              0.00
       4             40.00              2.50
Manning's 'N' friction factor =   0.030
-----------------------------------------------------------------
Sub-Channel flow  =      6.088(CFS)
  '     '       flow top width =     30.663(Ft.)
  '     '    velocity=    1.210(Ft/s)
  '     '       area =      5.031(Sq.Ft)
  '     '       Froude number =     0.526

Upstream point elevation =   694.200(Ft.)
Downstream point elevation =   694.000(Ft.)
Flow length =    30.000(Ft.)
Travel time  =    0.41 min.
Time of concentration =    9.22 min.
```

```
Depth of flow =   0.166(Ft.)
Average velocity =   1.210(Ft/s)
Total irregular channel flow =     6.088(CFS)
Irregular channel normal depth above invert elev. =   0.166(Ft.)
Average velocity of channel(s) =   1.210(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity =      6.215(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.982
Subarea runoff =      0.128(CFS) for      0.083(Ac.)
Total runoff =      6.104(CFS)        Total area =       1.637(Ac.)
Depth of flow =   0.166(Ft.), Average velocity =   1.211(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      139.000 to Point/Station      130.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   692.000(Ft.)
Downstream point/station elevation =   689.000(Ft.)
Pipe length  =    75.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.104(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     6.104(CFS)
Normal flow depth in pipe =    8.55(In.)
Flow top width inside pipe =   10.86(In.)
Critical depth could not be calculated.
Pipe flow velocity =     10.20(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =     9.34 min.
End of computations, total study area =           1.637 (Ac.)
```

# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

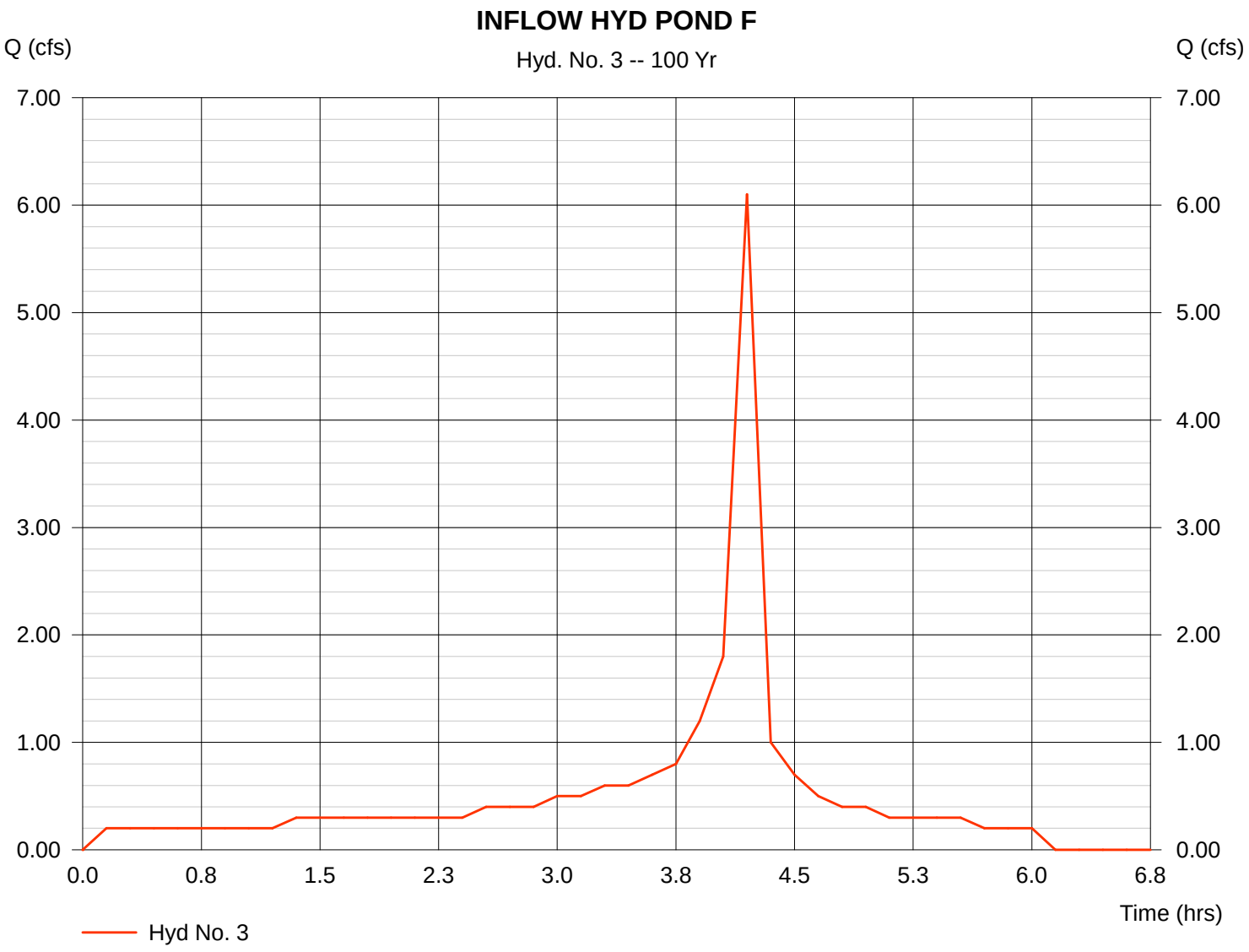
Monday, Jul 22 2013, 9:13 AM

## Hyd. No. 3

INFLOW HYD POND F

| | | | |
|---|---|---|---|
| Hydrograph type | = Manual | Peak discharge | = 6.10 cfs |
| Storm frequency | = 100 yrs | Time interval | = 9 min |

Hydrograph Volume = 12,312 cuft



# Hydrograph Plot

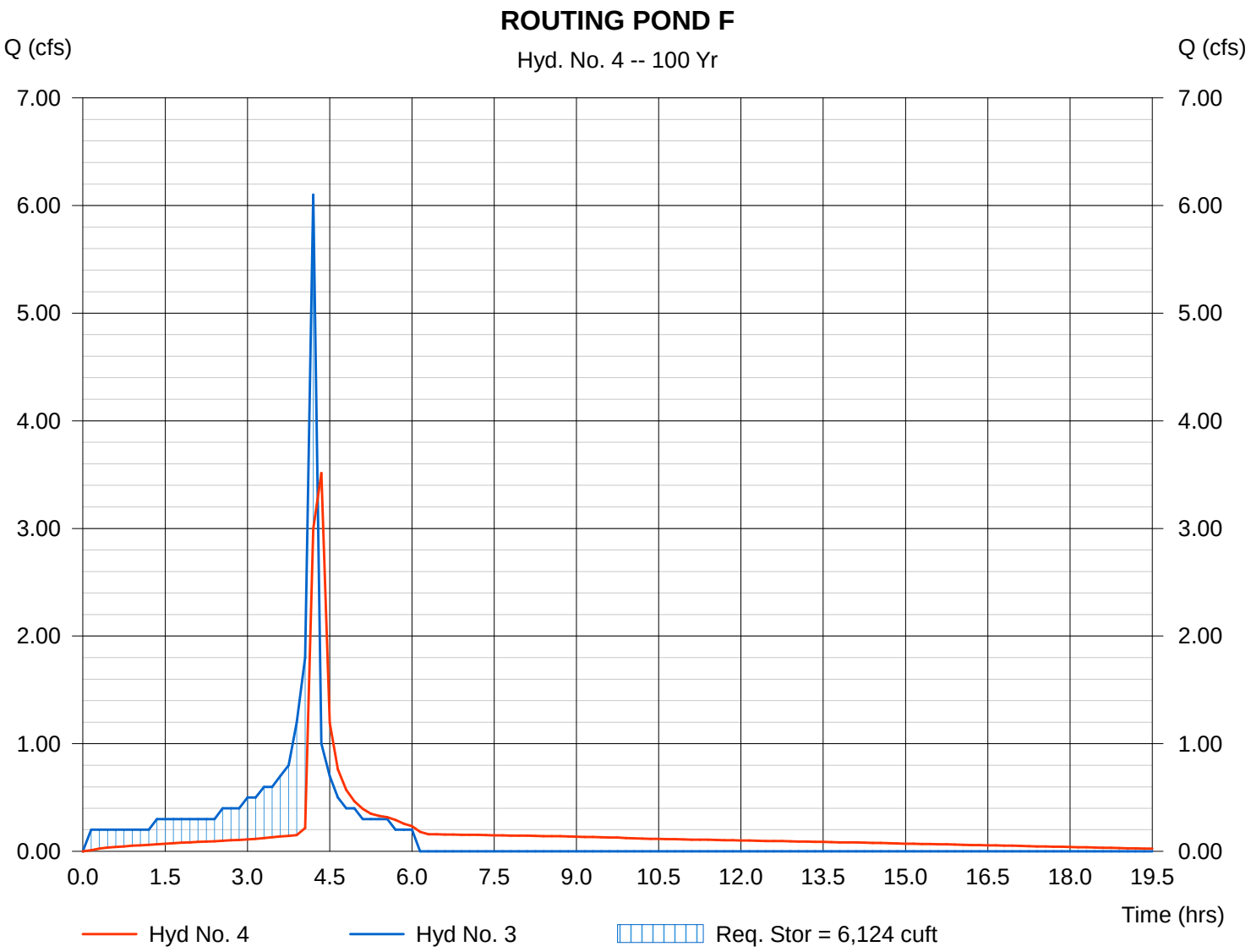
Hydraflow Hydrographs by Intelisolve | Monday, Jul 22 2013, 9:15 AM

## Hyd. No. 4

ROUTING POND F

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph type | = | Reservoir | Peak discharge | = | 3.51 cfs |
| Storm frequency | = | 100 yrs | Time interval | = | 9 min |
| Inflow hyd. No. | = | 3 | Max. Elevation | = | 695.63 ft |
| Reservoir name | = | POND F - STREET B | Max. Storage | = | 6,124 cuft |

Storage Indication method used. | Hydrograph Volume = 12,307 cuft



# Pond Report

Hydraflow Hydrographs by Intelisolve | Monday, Jul 22 2013, 9:17 AM

## Pond No. 2 - POND F - STREET B

### Pond Data

Pond storage is based on known values

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|---|---|---|---|---|
| 0.00 | 689.90 | 00 | 0 | 0 |
| 2.00 | 691.90 | 00 | 1,184 | 1,184 |
| 4.00 | 693.90 | 00 | 1,354 | 2,538 |
| 4.50 | 694.40 | 00 | 893 | 3,431 |
| 5.10 | 695.00 | 00 | 1,205 | 4,636 |
| 6.10 | 696.00 | 00 | 2,358 | 6,994 |

### Culvert / Orifice Structures

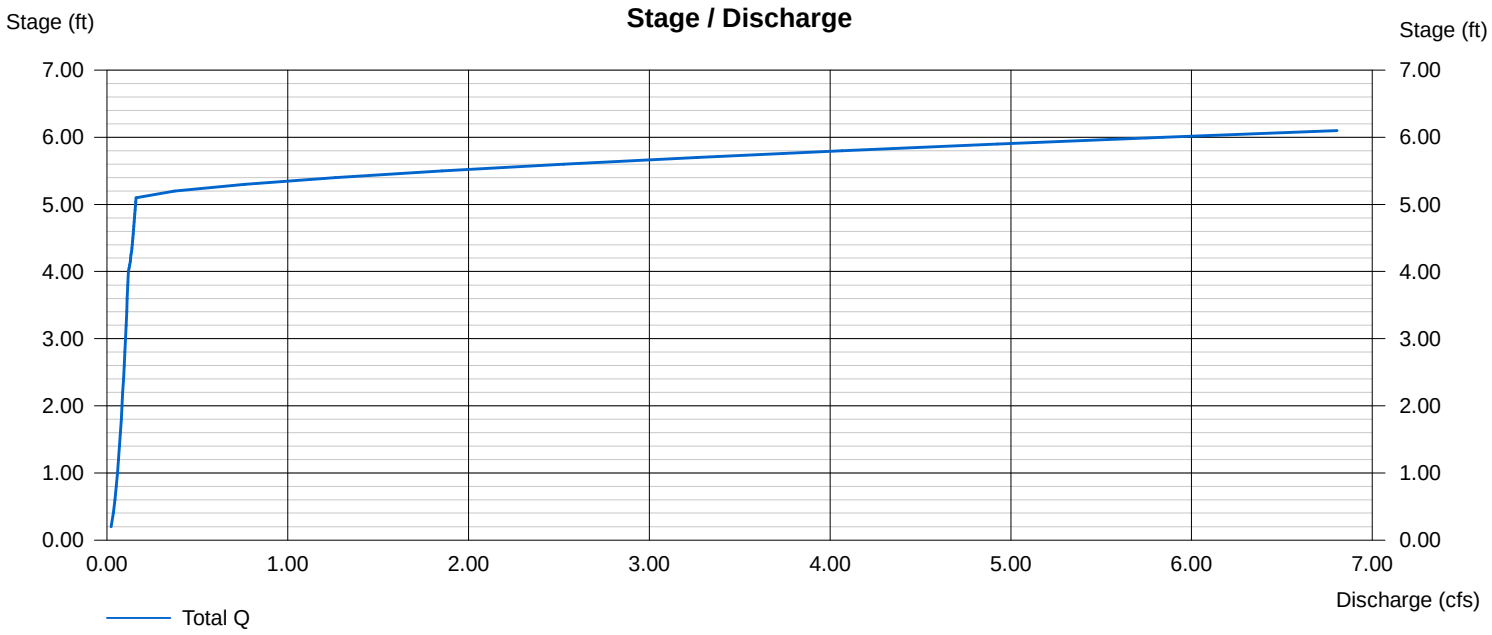
| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| **Rise (in)** | = 12.00 | 1.50 | 1.00 | 0.00 |
| **Span (in)** | = 12.00 | 1.50 | 1.00 | 0.00 |
| **No. Barrels** | = 1 | 1 | 1 | 0 |
| **Invert El. (ft)** | = 689.00 | 689.90 | 693.90 | 0.00 |
| **Length (ft)** | = 75.00 | 0.00 | 0.00 | 0.00 |
| **Slope (%)** | = 5.60 | 0.00 | 0.00 | 0.00 |
| **N-Value** | = .013 | .013 | .013 | .000 |
| **Orif. Coeff.** | = 0.60 | 0.60 | 0.60 | 0.00 |
| **Multi-Stage** | = n/a | Yes | Yes | No |

### Weir Structures

| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| **Crest Len (ft)** | = 2.00 | 0.00 | 0.00 | 0.00 |
| **Crest El. (ft)** | = 695.00 | 0.00 | 0.00 | 0.00 |
| **Weir Coeff.** | = 3.33 | 0.00 | 0.00 | 0.00 |
| **Weir Type** | = Riser | --- | --- | --- |
| **Multi-Stage** | = Yes | No | No | No |

**Exfiltration =** 0.000 in/hr (Wet area) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2004 Version 7.4

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
       Rational Hydrology Study        Date: 02/14/13
----------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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


Program License Serial Number 4012

----------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.000 to Point/Station       31.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      5.243(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.00 min.  Rain intensity =       5.24(In/Hr)
Total area =        0.072(Ac.)  Total runoff =     0.140(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.000 to Point/Station       32.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   698.500(Ft.)
Downstream point/station elevation =   693.300(Ft.)
Pipe length  =    85.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.140(CFS)
Nearest computed pipe diameter  =      3.00(In.)
Calculated individual pipe flow  =     0.140(CFS)
Normal flow depth in pipe =    1.74(In.)
Flow top width inside pipe =    2.96(In.)
Critical Depth =    2.66(In.)
Pipe flow velocity =      4.72(Ft/s)
Travel time through pipe =    0.30 min.
Time of concentration (TC) =    12.30 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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 =      0.072(Ac.)
Runoff from this stream =      0.140(CFS)
Time of concentration =   12.30 min.
Rainfall intensity =     5.160(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.000 to Point/Station       32.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      5.243(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.00 min.  Rain intensity =       5.24(In/Hr)
Total area =        0.065(Ac.)  Total runoff =     0.140(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.000 to Point/Station       32.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.065(Ac.)
Runoff from this stream =      0.140(CFS)
Time of concentration =   12.00 min.
Rainfall intensity =     5.243(In/Hr)
Summary of stream data:

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


1        0.140     12.30               5.160
2        0.140     12.00               5.243
Qmax(1) =
          1.000 *    1.000 *     0.140) +
          0.984 *    1.000 *     0.140) + =       0.278
Qmax(2) =
          1.000 *    0.976 *     0.140) +
          1.000 *    1.000 *     0.140) + =       0.277

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.140       0.140
Maximum flow rates at confluence using above data:
        0.278        0.277
Area of streams before confluence:
        0.072        0.065
Results of confluence:
Total flow rate =      0.278(CFS)
Time of concentration =    12.300 min.
Effective stream area after confluence =      0.137(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.000 to Point/Station       33.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   693.300(Ft.)
Downstream point/station elevation =   691.300(Ft.)
Pipe length  =    85.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.278(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.278(CFS)
Normal flow depth in pipe =    2.35(In.)
Flow top width inside pipe =    5.86(In.)
Critical Depth =    3.19(In.)
Pipe flow velocity =      3.91(Ft/s)
Travel time through pipe =    0.36 min.
Time of concentration (TC) =    12.66 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 =      0.137(Ac.)
Runoff from this stream =      0.278(CFS)
Time of concentration =   12.66 min.
Rainfall intensity =     5.064(In/Hr)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       33.000 to Point/Station       33.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      5.243(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.00 min.  Rain intensity =       5.24(In/Hr)
Total area =        0.065(Ac.)  Total runoff =     0.140(CFS)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       33.000 to Point/Station       34.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   691.300(Ft.)
Downstream point/station elevation =   690.800(Ft.)
Pipe length  =    43.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.140(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.140(CFS)
Normal flow depth in pipe =    1.96(In.)
Flow top width inside pipe =    5.63(In.)
Critical Depth =    2.23(In.)
Pipe flow velocity =      2.51(Ft/s)
Travel time through pipe =    0.29 min.
Time of concentration (TC) =    12.29 min.

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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 =      0.065(Ac.)
Runoff from this stream =      0.140(CFS)
Time of concentration =   12.29 min.
Rainfall intensity =     5.164(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       34.000 to Point/Station       34.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      5.243(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.00 min.  Rain intensity =       5.24(In/Hr)
Total area =        0.038(Ac.)  Total runoff =     0.070(CFS)
```

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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 2
Stream flow area =      0.038(Ac.)
Runoff from this stream =      0.070(CFS)
Time of concentration =   12.00 min.
Rainfall intensity =     5.243(In/Hr)
Summary of stream data:

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


1        0.140     12.29               5.164
2        0.070     12.00               5.243
Qmax(1) =
          1.000 *    1.000 *     0.140) +
          0.985 *    1.000 *     0.070) + =       0.209
Qmax(2) =
          1.000 *    0.977 *     0.140) +
          1.000 *    1.000 *     0.070) + =       0.207

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.140       0.070
Maximum flow rates at confluence using above data:
        0.209        0.207
Area of streams before confluence:
        0.065        0.038
Results of confluence:
Total flow rate =      0.209(CFS)
Time of concentration =    12.286 min.
Effective stream area after confluence =      0.103(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       34.000 to Point/Station       39.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   690.800(Ft.)
Downstream point/station elevation =   688.000(Ft.)
Pipe length  =     3.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.209(CFS)
Nearest computed pipe diameter  =      3.00(In.)
Calculated individual pipe flow  =     0.209(CFS)
Normal flow depth in pipe =    1.01(In.)
Flow top width inside pipe =    2.84(In.)
Critical depth could not be calculated.
Pipe flow velocity =     14.38(Ft/s)
Travel time through pipe =    0.00 min.
Time of concentration (TC) =    12.29 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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 =      0.103(Ac.)
Runoff from this stream =      0.209(CFS)
Time of concentration =   12.29 min.
Rainfall intensity =     5.163(In/Hr)
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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       35.000 to Point/Station       35.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      5.243(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.00 min.  Rain intensity =       5.24(In/Hr)
Total area =        0.073(Ac.)  Total runoff =     0.140(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       35.000 to Point/Station       36.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   698.500(Ft.)
Downstream point/station elevation =   695.000(Ft.)
Pipe length  =    88.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.140(CFS)
Nearest computed pipe diameter  =      3.00(In.)
Calculated individual pipe flow  =     0.140(CFS)
Normal flow depth in pipe =    2.02(In.)
Flow top width inside pipe =    2.81(In.)
Critical Depth =    2.66(In.)
Pipe flow velocity =      3.98(Ft/s)
Travel time through pipe =    0.37 min.
Time of concentration (TC) =    12.37 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 =      0.073(Ac.)
Runoff from this stream =      0.140(CFS)
Time of concentration =   12.37 min.
Rainfall intensity =     5.142(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       36.000 to Point/Station       36.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      5.243(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.00 min.  Rain intensity =       5.24(In/Hr)
Total area =        0.068(Ac.)  Total runoff =     0.140(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       36.000 to Point/Station       36.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.068(Ac.)
Runoff from this stream =      0.140(CFS)
```

```
Time of concentration =   12.00 min.
Rainfall intensity =     5.243(In/Hr)
Summary of stream data:

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


1        0.140     12.37               5.142
2        0.140     12.00               5.243
Qmax(1) =
          1.000 *    1.000 *     0.140) +
          0.981 *    1.000 *     0.140) + =       0.277
Qmax(2) =
          1.000 *    0.970 *     0.140) +
          1.000 *    1.000 *     0.140) + =       0.276

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.140       0.140
Maximum flow rates at confluence using above data:
        0.277        0.276
Area of streams before confluence:
        0.073        0.068
Results of confluence:
Total flow rate =      0.277(CFS)
Time of concentration =    12.368 min.
Effective stream area after confluence =      0.141(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       36.000 to Point/Station       37.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   695.000(Ft.)
Downstream point/station elevation =   691.300(Ft.)
Pipe length  =    84.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.277(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.277(CFS)
Normal flow depth in pipe =    1.98(In.)
Flow top width inside pipe =    5.64(In.)
Critical Depth =    3.19(In.)
Pipe flow velocity =      4.90(Ft/s)
Travel time through pipe =    0.29 min.
Time of concentration (TC) =    12.65 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       37.000 to Point/Station       37.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      5.243(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.00 min.  Rain intensity =       5.24(In/Hr)
Total area =        0.061(Ac.)  Total runoff =     0.140(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       37.000 to Point/Station       37.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.061(Ac.)
```

```
Runoff from this stream =      0.140(CFS)
Time of concentration =   12.00 min.
Rainfall intensity =     5.243(In/Hr)
Summary of stream data:

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


1        0.140     12.37               5.142
2        0.140     12.00               5.243
Qmax(1) =
          1.000 *    1.000 *     0.140) +
          0.981 *    1.000 *     0.140) + =       0.277
Qmax(2) =
          1.000 *    0.970 *     0.140) +
          1.000 *    1.000 *     0.140) + =       0.276

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.140       0.140
Maximum flow rates at confluence using above data:
        0.277        0.276
Area of streams before confluence:
        0.073        0.061
Results of confluence:
Total flow rate =      0.277(CFS)
Time of concentration =    12.368 min.
Effective stream area after confluence =      0.134(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       37.000 to Point/Station       38.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   691.300(Ft.)
Downstream point/station elevation =   689.300(Ft.)
Pipe length  =    84.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.277(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.277(CFS)
Normal flow depth in pipe =    2.34(In.)
Flow top width inside pipe =    5.85(In.)
Critical Depth =    3.19(In.)
Pipe flow velocity =      3.93(Ft/s)
Travel time through pipe =    0.36 min.
Time of concentration (TC) =    12.72 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 =      0.134(Ac.)
Runoff from this stream =      0.277(CFS)
Time of concentration =   12.72 min.
Rainfall intensity =     5.048(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       38.000 to Point/Station       38.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
```

```
Rainfall intensity (I) =      5.243(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.00 min.  Rain intensity =       5.24(In/Hr)
Total area =        0.040(Ac.)  Total runoff =     0.140(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 =      0.040(Ac.)
Runoff from this stream =      0.140(CFS)
Time of concentration =   12.00 min.
Rainfall intensity =     5.243(In/Hr)
Summary of stream data:

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


1        0.277     12.72               5.048
2        0.140     12.00               5.243
Qmax(1) =
          1.000 *    1.000 *     0.277) +
          0.963 *    1.000 *     0.140) + =       0.412
Qmax(2) =
          1.000 *    0.943 *     0.277) +
          1.000 *    1.000 *     0.140) + =       0.402

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.277       0.140
Maximum flow rates at confluence using above data:
        0.412        0.402
Area of streams before confluence:
        0.134        0.040
Results of confluence:
Total flow rate =      0.412(CFS)
Time of concentration =    12.725 min.
Effective stream area after confluence =      0.174(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       38.000 to Point/Station       39.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   689.300(Ft.)
Downstream point/station elevation =   688.000(Ft.)
Pipe length  =    33.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.412(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.412(CFS)
Normal flow depth in pipe =    2.52(In.)
Flow top width inside pipe =    5.92(In.)
Critical Depth =    3.92(In.)
Pipe flow velocity =      5.24(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =    12.83 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       39.000 to Point/Station       39.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.174(Ac.)
Runoff from this stream =      0.412(CFS)
Time of concentration =   12.83 min.
Rainfall intensity =     5.022(In/Hr)
Summary of stream data:
```

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


1        0.277     12.72               5.048
2        0.412     12.83               5.022
Qmax(1) =
          1.000 *    1.000 *     0.277) +
          1.000 *    0.992 *     0.412) + =       0.686
Qmax(2) =
          0.995 *    1.000 *     0.277) +
          1.000 *    1.000 *     0.412) + =       0.688

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.277       0.412
Maximum flow rates at confluence using above data:
        0.686        0.688
Area of streams before confluence:
        0.134        0.174
Results of confluence:
Total flow rate =      0.688(CFS)
Time of concentration =    12.830 min.
Effective stream area after confluence =      0.308(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       39.000 to Point/Station      130.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   688.000(Ft.)
Downstream point/station elevation =   685.700(Ft.)
Pipe length  =   128.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.688(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.688(CFS)
Normal flow depth in pipe =    4.51(In.)
Flow top width inside pipe =    5.18(In.)
Critical Depth =    5.03(In.)
Pipe flow velocity =      4.34(Ft/s)
Travel time through pipe =    0.49 min.
Time of concentration (TC) =    13.32 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      130.000 to Point/Station      130.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.308(Ac.)
Runoff from this stream =      0.688(CFS)
Time of concentration =   13.32 min.
Rainfall intensity =     4.901(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      139.000 to Point/Station      139.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      4.036(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  18.00 min.  Rain intensity =       4.04(In/Hr)
Total area =        1.640(Ac.)  Total runoff =     3.510(CFS)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      139.000 to Point/Station      130.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   689.900(Ft.)
Downstream point/station elevation =   685.700(Ft.)
Pipe length  =    75.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.510(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     3.510(CFS)
Normal flow depth in pipe =    6.66(In.)
Flow top width inside pipe =    7.90(In.)
Critical depth could not be calculated.
Pipe flow velocity =     10.02(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =    18.12 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      130.000 to Point/Station      130.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.640(Ac.)
Runoff from this stream =      3.510(CFS)
Time of concentration =   18.12 min.
Rainfall intensity =     4.018(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      129.000 to Point/Station      129.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      4.036(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  18.00 min.  Rain intensity =       4.04(In/Hr)
Total area =        1.340(Ac.)  Total runoff =     2.890(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      129.000 to Point/Station      130.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   687.000(Ft.)
Downstream point/station elevation =   685.700(Ft.)
Pipe length  =   123.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.890(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.890(CFS)
Normal flow depth in pipe =    8.04(In.)
Flow top width inside pipe =   11.29(In.)
Critical Depth =    8.75(In.)
Pipe flow velocity =      5.17(Ft/s)
Travel time through pipe =    0.40 min.
Time of concentration (TC) =    18.40 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      130.000 to Point/Station      130.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      1.340(Ac.)
```

```
Runoff from this stream =      2.890(CFS)
Time of concentration =   18.40 min.
Rainfall intensity =     3.980(In/Hr)
Summary of stream data:

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


1        0.688     13.32               4.901
2        3.510     18.12               4.018
3        2.890     18.40               3.980
Qmax(1) =
          1.000 *    1.000 *     0.688) +
          1.000 *    0.735 *     3.510) +
          1.000 *    0.724 *     2.890) + =       5.360
Qmax(2) =
          0.820 *    1.000 *     0.688) +
          1.000 *    1.000 *     3.510) +
          1.000 *    0.985 *     2.890) + =       6.921
Qmax(3) =
          0.812 *    1.000 *     0.688) +
          0.990 *    1.000 *     3.510) +
          1.000 *    1.000 *     2.890) + =       6.925

Total of 3 streams to confluence:
Flow rates before confluence point:
       0.688       3.510       2.890
Maximum flow rates at confluence using above data:
        5.360        6.921        6.925
Area of streams before confluence:
        0.308        1.640        1.340
Results of confluence:
Total flow rate =      6.925(CFS)
Time of concentration =    18.397 min.
Effective stream area after confluence =      3.288(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      130.000 to Point/Station       42.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   685.700(Ft.)
Downstream point/station elevation =   684.700(Ft.)
Pipe length  =    92.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.925(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     6.925(CFS)
Normal flow depth in pipe =   10.38(In.)
Flow top width inside pipe =   17.79(In.)
Critical Depth =   12.22(In.)
Pipe flow velocity =      6.56(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =    18.63 min.


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Process from Point/Station       42.000 to Point/Station       42.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.288(Ac.)
Runoff from this stream =      6.925(CFS)
Time of concentration =   18.63 min.
Rainfall intensity =     3.948(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       40.000 to Point/Station       40.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
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Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      5.243(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.00 min.  Rain intensity =       5.24(In/Hr)
Total area =        0.173(Ac.)  Total runoff =     0.210(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       40.000 to Point/Station       42.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   685.500(Ft.)
Downstream point/station elevation =   684.700(Ft.)
Pipe length  =    12.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.210(CFS)
Nearest computed pipe diameter  =      3.00(In.)
Calculated individual pipe flow  =     0.210(CFS)
Normal flow depth in pipe =    2.27(In.)
Flow top width inside pipe =    2.58(In.)
Critical depth could not be calculated.
Pipe flow velocity =      5.27(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    12.04 min.


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Process from Point/Station       42.000 to Point/Station       42.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.173(Ac.)
Runoff from this stream =      0.210(CFS)
Time of concentration =   12.04 min.
Rainfall intensity =     5.232(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       41.000 to Point/Station       41.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      5.243(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.00 min.  Rain intensity =       5.24(In/Hr)
Total area =        0.175(Ac.)  Total runoff =     0.210(CFS)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       41.000 to Point/Station       42.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   685.500(Ft.)
Downstream point/station elevation =   684.700(Ft.)
Pipe length  =    38.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.210(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.210(CFS)
Normal flow depth in pipe =    2.08(In.)
Flow top width inside pipe =    5.71(In.)
Critical Depth =    2.76(In.)
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Pipe flow velocity =      3.48(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =    12.18 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       42.000 to Point/Station       42.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.175(Ac.)
Runoff from this stream =      0.210(CFS)
Time of concentration =   12.18 min.
Rainfall intensity =     5.192(In/Hr)
Summary of stream data:

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


1        6.925     18.63               3.948
2        0.210     12.04               5.232
3        0.210     12.18               5.192
Qmax(1) =
          1.000 *    1.000 *     6.925) +
          0.755 *    1.000 *     0.210) +
          0.760 *    1.000 *     0.210) + =       7.243
Qmax(2) =
          1.000 *    0.646 *     6.925) +
          1.000 *    1.000 *     0.210) +
          1.000 *    0.988 *     0.210) + =       4.892
Qmax(3) =
          1.000 *    0.654 *     6.925) +
          0.992 *    1.000 *     0.210) +
          1.000 *    1.000 *     0.210) + =       4.947

Total of 3 streams to confluence:
Flow rates before confluence point:
       6.925       0.210       0.210
Maximum flow rates at confluence using above data:
        7.243        4.892        4.947
Area of streams before confluence:
        3.288        0.173        0.175
Results of confluence:
Total flow rate =      7.243(CFS)
Time of concentration =    18.631 min.
Effective stream area after confluence =      3.636(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       42.000 to Point/Station       43.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   684.700(Ft.)
Downstream point/station elevation =   684.000(Ft.)
Pipe length  =    52.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.243(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     7.243(CFS)
Normal flow depth in pipe =   11.86(In.)
Flow top width inside pipe =   12.21(In.)
Critical Depth =   12.90(In.)
Pipe flow velocity =      6.96(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =    18.76 min.
End of computations, total study area =          3.810 (Ac.)
```

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                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2004 Version 7.4

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
       Rational Hydrology Study        Date: 02/15/13
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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


Program License Serial Number 4012

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       80.000 to Point/Station       52.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      6.810(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   8.00 min.  Rain intensity =       6.81(In/Hr)
Total area =       50.718(Ac.)  Total runoff =   131.200(CFS)


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Process from Point/Station       80.000 to Point/Station       52.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   686.500(Ft.)
Downstream point/station elevation =   679.800(Ft.)
Pipe length  =   322.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   131.200(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =   131.200(CFS)
Normal flow depth in pipe =   31.27(In.)
Flow top width inside pipe =   36.64(In.)
Critical Depth =   39.79(In.)
Pipe flow velocity =     17.08(Ft/s)
Travel time through pipe =    0.31 min.
Time of concentration (TC) =     8.31 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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 =     50.718(Ac.)
Runoff from this stream =    131.200(CFS)
Time of concentration =    8.31 min.
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Rainfall intensity =     6.643(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       44.000 to Point/Station       45.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   87.000(Ft.)
Highest elevation =  696.000(Ft.)
Lowest elevation =  693.000(Ft.)
Elevation difference =    3.000(Ft.) Slope =  3.448 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   3.45 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.65 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  90.000^.5)/(   3.448^(1/3)]=   5.65
Rainfall intensity (I) =      8.521(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.332(CFS)
Total initial stream area =        0.065(Ac.)


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Process from Point/Station       45.000 to Point/Station       46.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   686.300(Ft.)
Downstream point/station elevation =   685.500(Ft.)
Pipe length  =    84.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.332(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.332(CFS)
Normal flow depth in pipe =    3.38(In.)
Flow top width inside pipe =    5.95(In.)
Critical Depth =    3.50(In.)
Pipe flow velocity =      2.92(Ft/s)
Travel time through pipe =    0.48 min.
Time of concentration (TC) =     6.13 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       46.000 to Point/Station       46.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.13 min.
Rainfall intensity =      8.085(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.074
Subarea runoff =      0.269(CFS) for      0.059(Ac.)
Total runoff =      0.602(CFS)       Total area =       0.124(Ac.)
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Process from Point/Station       46.000 to Point/Station       47.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   685.500(Ft.)
Downstream point/station elevation =   680.300(Ft.)
Pipe length  =    86.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.602(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.602(CFS)
Normal flow depth in pipe =    2.77(In.)
Flow top width inside pipe =    5.98(In.)
Critical Depth =    4.73(In.)
Pipe flow velocity =      6.79(Ft/s)
Travel time through pipe =    0.21 min.
Time of concentration (TC) =     6.34 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       47.000 to Point/Station       47.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.34 min.
Rainfall intensity =      7.911(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.113
Subarea runoff =      0.296(CFS) for      0.065(Ac.)
Total runoff =      0.897(CFS)        Total area =       0.189(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       47.000 to Point/Station       52.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   680.300(Ft.)
Downstream point/station elevation =   679.800(Ft.)
Pipe length  =     9.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.897(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.897(CFS)
Normal flow depth in pipe =    3.62(In.)
Flow top width inside pipe =    5.87(In.)
Critical Depth =    5.52(In.)
Pipe flow velocity =      7.24(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =     6.36 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       52.000 to Point/Station       52.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.189(Ac.)
Runoff from this stream =      0.897(CFS)
Time of concentration =    6.36 min.
Rainfall intensity =     7.894(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       48.000 to Point/Station       49.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
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Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   71.000(Ft.)
Highest elevation =  696.000(Ft.)
Lowest elevation =  694.000(Ft.)
Elevation difference =    2.000(Ft.) Slope =  2.817 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   2.82 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.05 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  90.000^.5)/(   2.817^(1/3)]=   6.05
Rainfall intensity (I) =      8.159(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.259(CFS)
Total initial stream area =        0.053(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       49.000 to Point/Station       50.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   687.300(Ft.)
Downstream point/station elevation =   684.300(Ft.)
Pipe length  =    86.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.259(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.259(CFS)
Normal flow depth in pipe =    2.03(In.)
Flow top width inside pipe =    5.68(In.)
Critical Depth =    3.08(In.)
Pipe flow velocity =      4.42(Ft/s)
Travel time through pipe =    0.32 min.
Time of concentration (TC) =     6.37 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       50.000 to Point/Station       50.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.37 min.
Rainfall intensity =      7.888(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.070
Subarea runoff =      0.294(CFS) for      0.064(Ac.)
Total runoff =      0.554(CFS)        Total area =       0.117(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       50.000 to Point/Station       51.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   684.300(Ft.)
Downstream point/station elevation =   680.300(Ft.)
Pipe length  =   108.00(Ft.)   Manning's N = 0.013
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```
No. of pipes = 1  Required pipe flow  =     0.554(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.554(CFS)
Normal flow depth in pipe =    3.05(In.)
Flow top width inside pipe =    6.00(In.)
Critical Depth =    4.55(In.)
Pipe flow velocity =      5.54(Ft/s)
Travel time through pipe =    0.33 min.
Time of concentration (TC) =     6.69 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       51.000 to Point/Station       51.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.69 min.
Rainfall intensity =      7.639(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.119
Subarea runoff =      0.358(CFS) for      0.082(Ac.)
Total runoff =      0.912(CFS)        Total area =       0.199(Ac.)


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Process from Point/Station       51.000 to Point/Station       52.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   680.300(Ft.)
Downstream point/station elevation =   679.800(Ft.)
Pipe length  =    37.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.912(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.912(CFS)
Normal flow depth in pipe =    4.37(In.)
Flow top width inside pipe =    9.00(In.)
Critical Depth =    5.25(In.)
Pipe flow velocity =      4.30(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     6.84 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       52.000 to Point/Station       52.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.199(Ac.)
Runoff from this stream =      0.912(CFS)
Time of concentration =    6.84 min.
Rainfall intensity =     7.535(In/Hr)
Summary of stream data:

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


1      131.200      8.31               6.643
2        0.897      6.36               7.894
3        0.912      6.84               7.535
Qmax(1) =
          1.000 *    1.000 *   131.200) +
          0.842 *    1.000 *     0.897) +
          0.882 *    1.000 *     0.912) + =     132.759
```

```
Qmax(2) =
          1.000 *    0.765 *   131.200) +
          1.000 *    1.000 *     0.897) +
          1.000 *    0.930 *     0.912) + =     102.148
Qmax(3) =
          1.000 *    0.822 *   131.200) +
          0.955 *    1.000 *     0.897) +
          1.000 *    1.000 *     0.912) + =     109.679

Total of 3 streams to confluence:
Flow rates before confluence point:
     131.200       0.897       0.912
Maximum flow rates at confluence using above data:
      132.759      102.148      109.679
Area of streams before confluence:
       50.718        0.189        0.199
Results of confluence:
Total flow rate =    132.759(CFS)
Time of concentration =     8.314 min.
Effective stream area after confluence =     51.106(Ac.)


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Process from Point/Station       52.000 to Point/Station       53.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   679.800(Ft.)
Downstream point/station elevation =   678.800(Ft.)
Pipe length  =    84.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   132.759(CFS)
Nearest computed pipe diameter  =     48.00(In.)
Calculated individual pipe flow  =   132.759(CFS)
Normal flow depth in pipe =   33.89(In.)
Flow top width inside pipe =   43.73(In.)
Critical Depth =   41.29(In.)
Pipe flow velocity =     13.99(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     8.41 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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 =     51.106(Ac.)
Runoff from this stream =    132.759(CFS)
Time of concentration =    8.41 min.
Rainfall intensity =     6.592(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       47.000 to Point/Station       53.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   84.000(Ft.)
Highest elevation =  687.000(Ft.)
Lowest elevation =  684.000(Ft.)
Elevation difference =    3.000(Ft.) Slope =  3.571 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   3.57 %, in a development type of
 10.9 DU/A or Less
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In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.59 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  90.000^.5)/(   3.571^(1/3)]=   5.59
Rainfall intensity (I) =      8.585(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.340(CFS)
Total initial stream area =        0.066(Ac.)


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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 2
Stream flow area =      0.066(Ac.)
Runoff from this stream =      0.340(CFS)
Time of concentration =    5.59 min.
Rainfall intensity =     8.585(In/Hr)
Summary of stream data:

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


1      132.759      8.41               6.592
2        0.340      5.59               8.585
Qmax(1) =
          1.000 *    1.000 *   132.759) +
          0.768 *    1.000 *     0.340) + =     133.020
Qmax(2) =
          1.000 *    0.664 *   132.759) +
          1.000 *    1.000 *     0.340) + =      88.475

Total of 2 streams to confluence:
Flow rates before confluence point:
     132.759       0.340
Maximum flow rates at confluence using above data:
      133.020       88.475
Area of streams before confluence:
       51.106        0.066
Results of confluence:
Total flow rate =    133.020(CFS)
Time of concentration =     8.414 min.
Effective stream area after confluence =     51.172(Ac.)


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Process from Point/Station       53.000 to Point/Station       58.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   678.800(Ft.)
Downstream point/station elevation =   676.000(Ft.)
Pipe length  =    30.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   133.020(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =   133.020(CFS)
Normal flow depth in pipe =   22.80(In.)
Flow top width inside pipe =   30.50(In.)
Critical depth could not be calculated.
Pipe flow velocity =     30.37(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =     8.43 min.


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Process from Point/Station       58.000 to Point/Station       58.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     51.172(Ac.)
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Runoff from this stream =    133.020(CFS)
Time of concentration =    8.43 min.
Rainfall intensity =     6.584(In/Hr)


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Process from Point/Station       51.000 to Point/Station       57.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  112.000(Ft.)
Highest elevation =  687.000(Ft.)
Lowest elevation =  683.000(Ft.)
Elevation difference =    4.000(Ft.) Slope =  3.571 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   3.57 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.59 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  90.000^.5)/(   3.571^(1/3)]=   5.59
Rainfall intensity (I) =      8.585(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.438(CFS)
Total initial stream area =        0.085(Ac.)


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Process from Point/Station       57.000 to Point/Station       58.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   678.500(Ft.)
Downstream point/station elevation =   676.000(Ft.)
Pipe length  =    35.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.438(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.438(CFS)
Normal flow depth in pipe =    2.22(In.)
Flow top width inside pipe =    5.79(In.)
Critical Depth =    4.05(In.)
Pipe flow velocity =      6.63(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =     5.67 min.


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Process from Point/Station       58.000 to Point/Station       58.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.085(Ac.)
Runoff from this stream =      0.438(CFS)
Time of concentration =    5.67 min.
Rainfall intensity =     8.499(In/Hr)
Summary of stream data:

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


1      133.020      8.43               6.584
2        0.438      5.67               8.499
Qmax(1) =
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```
          1.000 *    1.000 *   133.020) +
          0.775 *    1.000 *     0.438) + =     133.359
Qmax(2) =
          1.000 *    0.673 *   133.020) +
          1.000 *    1.000 *     0.438) + =      89.963

Total of 2 streams to confluence:
Flow rates before confluence point:
     133.020       0.438
Maximum flow rates at confluence using above data:
      133.359       89.963
Area of streams before confluence:
       51.172        0.085
Results of confluence:
Total flow rate =    133.359(CFS)
Time of concentration =     8.431 min.
Effective stream area after confluence =     51.257(Ac.)


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Process from Point/Station       58.000 to Point/Station       54.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   676.000(Ft.)
Downstream point/station elevation =   675.500(Ft.)
Pipe length  =    56.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   133.359(CFS)
Nearest computed pipe diameter  =     48.00(In.)
Calculated individual pipe flow  =   133.359(CFS)
Normal flow depth in pipe =   38.63(In.)
Flow top width inside pipe =   38.06(In.)
Critical Depth =   41.36(In.)
Pipe flow velocity =     12.31(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =     8.51 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 =     51.257(Ac.)
Runoff from this stream =    133.359(CFS)
Time of concentration =    8.51 min.
Rainfall intensity =     6.546(In/Hr)


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Process from Point/Station       53.000 to Point/Station       54.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   86.000(Ft.)
Highest elevation =  684.000(Ft.)
Lowest elevation =  681.000(Ft.)
Elevation difference =    3.000(Ft.) Slope =  3.488 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   3.49 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.63 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
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TC = [1.8*(1.1-0.6000)*(  90.000^.5)/(   3.488^(1/3)]=   5.63
Rainfall intensity (I) =      8.542(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.302(CFS)
Total initial stream area =        0.059(Ac.)


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Process from Point/Station       54.000 to Point/Station       54.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.059(Ac.)
Runoff from this stream =      0.302(CFS)
Time of concentration =    5.63 min.
Rainfall intensity =     8.542(In/Hr)
Summary of stream data:

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


1      133.359      8.51               6.546
2        0.302      5.63               8.542
Qmax(1) =
          1.000 *    1.000 *   133.359) +
          0.766 *    1.000 *     0.302) + =     133.591
Qmax(2) =
          1.000 *    0.662 *   133.359) +
          1.000 *    1.000 *     0.302) + =      88.565

Total of 2 streams to confluence:
Flow rates before confluence point:
     133.359       0.302
Maximum flow rates at confluence using above data:
      133.591       88.565
Area of streams before confluence:
       51.257        0.059
Results of confluence:
Total flow rate =    133.591(CFS)
Time of concentration =     8.507 min.
Effective stream area after confluence =     51.316(Ac.)


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Process from Point/Station       54.000 to Point/Station       59.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   675.500(Ft.)
Downstream point/station elevation =   673.000(Ft.)
Pipe length  =    80.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   133.591(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =   133.591(CFS)
Normal flow depth in pipe =   29.34(In.)
Flow top width inside pipe =   33.67(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.95(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =     8.57 min.


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Process from Point/Station       59.000 to Point/Station       59.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     51.316(Ac.)
Runoff from this stream =    133.591(CFS)
Time of concentration =    8.57 min.
Rainfall intensity =     6.513(In/Hr)
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Process from Point/Station       54.000 to Point/Station       55.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   80.000(Ft.)
Highest elevation =  681.000(Ft.)
Lowest elevation =  678.000(Ft.)
Elevation difference =    3.000(Ft.) Slope =  3.750 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   3.75 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.50 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  90.000^.5)/(   3.750^(1/3)]=   5.50
Rainfall intensity (I) =      8.676(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.333(CFS)
Total initial stream area =        0.064(Ac.)


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Process from Point/Station       55.000 to Point/Station       59.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   673.500(Ft.)
Downstream point/station elevation =   673.000(Ft.)
Pipe length  =    10.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.333(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.333(CFS)
Normal flow depth in pipe =    2.11(In.)
Flow top width inside pipe =    5.73(In.)
Critical Depth =    3.51(In.)
Pipe flow velocity =      5.41(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     5.53 min.


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Process from Point/Station       59.000 to Point/Station       59.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.064(Ac.)
Runoff from this stream =      0.333(CFS)
Time of concentration =    5.53 min.
Rainfall intensity =     8.645(In/Hr)


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Process from Point/Station       57.000 to Point/Station       58.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
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Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  145.000(Ft.)
Highest elevation =  683.000(Ft.)
Lowest elevation =  678.000(Ft.)
Elevation difference =    5.000(Ft.) Slope =  3.448 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   3.45 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.65 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  90.000^.5)/(   3.448^(1/3)]=   5.65
Rainfall intensity (I) =      8.521(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.552(CFS)
Total initial stream area =        0.108(Ac.)


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Process from Point/Station       58.000 to Point/Station       59.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   673.500(Ft.)
Downstream point/station elevation =   673.000(Ft.)
Pipe length  =    35.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.552(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.552(CFS)
Normal flow depth in pipe =    4.15(In.)
Flow top width inside pipe =    5.54(In.)
Critical Depth =    4.54(In.)
Pipe flow velocity =      3.81(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =     5.80 min.


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Process from Point/Station       59.000 to Point/Station       59.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.108(Ac.)
Runoff from this stream =      0.552(CFS)
Time of concentration =    5.80 min.
Rainfall intensity =     8.375(In/Hr)
Summary of stream data:

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


1      133.591      8.57               6.513
2        0.333      5.53               8.645
3        0.552      5.80               8.375
Qmax(1) =
          1.000 *    1.000 *   133.591) +
          0.753 *    1.000 *     0.333) +
          0.778 *    1.000 *     0.552) + =     134.271
Qmax(2) =
          1.000 *    0.645 *   133.591) +
          1.000 *    1.000 *     0.333) +
          1.000 *    0.952 *     0.552) + =      86.973
Qmax(3) =
          1.000 *    0.677 *   133.591) +
          0.969 *    1.000 *     0.333) +
          1.000 *    1.000 *     0.552) + =      91.322

Total of 3 streams to confluence:
Flow rates before confluence point:
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```
     133.591       0.333       0.552
Maximum flow rates at confluence using above data:
      134.271       86.973       91.322
Area of streams before confluence:
       51.316        0.064        0.108
Results of confluence:
Total flow rate =    134.271(CFS)
Time of concentration =     8.573 min.
Effective stream area after confluence =     51.488(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       59.000 to Point/Station       62.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   673.000(Ft.)
Downstream point/station elevation =   663.000(Ft.)
Pipe length  =   223.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   134.271(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =   134.271(CFS)
Normal flow depth in pipe =   28.03(In.)
Flow top width inside pipe =   29.89(In.)
Critical depth could not be calculated.
Pipe flow velocity =     22.74(Ft/s)
Travel time through pipe =    0.16 min.
Time of concentration (TC) =     8.74 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       62.000 to Point/Station       62.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     51.488(Ac.)
Runoff from this stream =    134.271(CFS)
Time of concentration =    8.74 min.
Rainfall intensity =     6.434(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       55.000 to Point/Station       56.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  222.000(Ft.)
Highest elevation =  678.000(Ft.)
Lowest elevation =  671.000(Ft.)
Elevation difference =    7.000(Ft.) Slope =  3.153 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   3.15 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.82 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  90.000^.5)/(   3.153^(1/3)]=   5.82
Rainfall intensity (I) =      8.359(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.853(CFS)
Total initial stream area =        0.170(Ac.)


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Process from Point/Station       56.000 to Point/Station       62.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   664.300(Ft.)
Downstream point/station elevation =   663.000(Ft.)
Pipe length  =     5.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.853(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.853(CFS)
Normal flow depth in pipe =    2.25(In.)
Flow top width inside pipe =    5.81(In.)
Critical Depth =    5.44(In.)
Pipe flow velocity =     12.72(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =     5.83 min.


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Process from Point/Station       62.000 to Point/Station       62.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.170(Ac.)
Runoff from this stream =      0.853(CFS)
Time of concentration =    5.83 min.
Rainfall intensity =     8.353(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       58.000 to Point/Station       60.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  102.000(Ft.)
Highest elevation =  678.000(Ft.)
Lowest elevation =  675.000(Ft.)
Elevation difference =    3.000(Ft.) Slope =  2.941 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   2.94 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.96 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  90.000^.5)/(   2.941^(1/3)]=   5.96
Rainfall intensity (I) =      8.235(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.395(CFS)
Total initial stream area =        0.080(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       60.000 to Point/Station       61.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   668.300(Ft.)
Downstream point/station elevation =   664.300(Ft.)
Pipe length  =    88.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.395(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.395(CFS)
Normal flow depth in pipe =    2.37(In.)
Flow top width inside pipe =    5.87(In.)
Critical Depth =    3.84(In.)
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Pipe flow velocity =      5.46(Ft/s)
Travel time through pipe =    0.27 min.
Time of concentration (TC) =     6.23 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       61.000 to Point/Station       61.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.23 min.
Rainfall intensity =      8.004(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.088
Subarea runoff =      0.311(CFS) for      0.067(Ac.)
Total runoff =      0.706(CFS)        Total area =       0.147(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       61.000 to Point/Station       62.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   664.300(Ft.)
Downstream point/station elevation =   663.000(Ft.)
Pipe length  =    38.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.706(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.706(CFS)
Normal flow depth in pipe =    3.63(In.)
Flow top width inside pipe =    5.87(In.)
Critical Depth =    5.08(In.)
Pipe flow velocity =      5.68(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =     6.34 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       62.000 to Point/Station       62.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.147(Ac.)
Runoff from this stream =      0.706(CFS)
Time of concentration =    6.34 min.
Rainfall intensity =     7.913(In/Hr)
Summary of stream data:

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


1      134.271      8.74               6.434
2        0.853      5.83               8.353
3        0.706      6.34               7.913
Qmax(1) =
          1.000 *    1.000 *   134.271) +
          0.770 *    1.000 *     0.853) +
          0.813 *    1.000 *     0.706) + =     135.502
Qmax(2) =
          1.000 *    0.667 *   134.271) +
          1.000 *    1.000 *     0.853) +
          1.000 *    0.920 *     0.706) + =      91.088
Qmax(3) =
          1.000 *    0.726 *   134.271) +
```

```
          0.947 *    1.000 *     0.853) +
          1.000 *    1.000 *     0.706) + =      98.937

Total of 3 streams to confluence:
Flow rates before confluence point:
     134.271       0.853       0.706
Maximum flow rates at confluence using above data:
      135.502       91.088       98.937
Area of streams before confluence:
       51.488        0.170        0.147
Results of confluence:
Total flow rate =    135.502(CFS)
Time of concentration =     8.737 min.
Effective stream area after confluence =     51.805(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       62.000 to Point/Station       29.100
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   663.000(Ft.)
Downstream point/station elevation =   662.500(Ft.)
Pipe length  =    34.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   135.502(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =   135.502(CFS)
Normal flow depth in pipe =   34.13(In.)
Flow top width inside pipe =   38.53(In.)
Critical Depth =   41.17(In.)
Pipe flow velocity =     15.07(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =     8.77 min.
End of computations, total study area =          51.805 (Ac.)
```

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                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2004 Version 7.4

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
       Rational Hydrology Study        Date: 02/15/13
----------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

----------------------------------------------------------------------
File: D12052POSTC.RD3

Program License Serial Number 4012

----------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       80.000 to Point/Station       52.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      6.810(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   8.00 min.  Rain intensity =       6.81(In/Hr)
Total area =       50.718(Ac.)  Total runoff =   131.200(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       80.000 to Point/Station       52.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   686.500(Ft.)
Downstream point/station elevation =   679.800(Ft.)
Pipe length  =   322.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   131.200(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =   131.200(CFS)
Normal flow depth in pipe =   31.27(In.)
Flow top width inside pipe =   36.64(In.)
Critical Depth =   39.79(In.)
Pipe flow velocity =     17.08(Ft/s)
Travel time through pipe =    0.31 min.
Time of concentration (TC) =     8.31 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       52.000 to Point/Station       52.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     50.718(Ac.)
Runoff from this stream =    131.200(CFS)
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Time of concentration =    8.31 min.
Rainfall intensity =     6.643(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       45.000 to Point/Station       45.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      5.243(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.00 min.  Rain intensity =       5.24(In/Hr)
Total area =        0.066(Ac.)  Total runoff =     0.140(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       45.000 to Point/Station       46.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   686.300(Ft.)
Downstream point/station elevation =   685.500(Ft.)
Pipe length  =    84.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.140(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.140(CFS)
Normal flow depth in pipe =    2.07(In.)
Flow top width inside pipe =    5.70(In.)
Critical Depth =    2.23(In.)
Pipe flow velocity =      2.33(Ft/s)
Travel time through pipe =    0.60 min.
Time of concentration (TC) =    12.60 min.


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Process from Point/Station       46.000 to Point/Station       46.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      0.066(Ac.)
Runoff from this stream =      0.140(CFS)
Time of concentration =   12.60 min.
Rainfall intensity =     5.080(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       46.000 to Point/Station       46.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      5.243(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.00 min.  Rain intensity =       5.24(In/Hr)
Total area =        0.059(Ac.)  Total runoff =     0.140(CFS)


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Process from Point/Station       46.000 to Point/Station       46.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.059(Ac.)
Runoff from this stream =      0.140(CFS)
Time of concentration =   12.00 min.
Rainfall intensity =     5.243(In/Hr)
Summary of stream data:

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


1        0.140     12.60               5.080
2        0.140     12.00               5.243
Qmax(1) =
          1.000 *    1.000 *     0.140) +
          0.969 *    1.000 *     0.140) + =       0.276
Qmax(2) =
          1.000 *    0.952 *     0.140) +
          1.000 *    1.000 *     0.140) + =       0.273

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.140       0.140
Maximum flow rates at confluence using above data:
        0.276        0.273
Area of streams before confluence:
        0.066        0.059
Results of confluence:
Total flow rate =      0.276(CFS)
Time of concentration =    12.600 min.
Effective stream area after confluence =      0.125(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       46.000 to Point/Station       47.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________
Upstream point/station elevation =   685.500(Ft.)
Downstream point/station elevation =   680.300(Ft.)
Pipe length  =    86.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.276(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.276(CFS)
Normal flow depth in pipe =    1.82(In.)
Flow top width inside pipe =    5.52(In.)
Critical Depth =    3.18(In.)
Pipe flow velocity =      5.49(Ft/s)
Travel time through pipe =    0.26 min.
Time of concentration (TC) =    12.86 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       47.000 to Point/Station       47.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      0.125(Ac.)
Runoff from this stream =      0.276(CFS)
Time of concentration =   12.86 min.
Rainfall intensity =     5.014(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       47.000 to Point/Station       47.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
____________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
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Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      5.243(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.00 min.  Rain intensity =       5.24(In/Hr)
Total area =        0.065(Ac.)  Total runoff =     0.140(CFS)


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Process from Point/Station       47.000 to Point/Station       47.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.065(Ac.)
Runoff from this stream =      0.140(CFS)
Time of concentration =   12.00 min.
Rainfall intensity =     5.243(In/Hr)
Summary of stream data:

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


1        0.276     12.86               5.014
2        0.140     12.00               5.243
Qmax(1) =
          1.000 *    1.000 *     0.276) +
          0.956 *    1.000 *     0.140) + =       0.410
Qmax(2) =
          1.000 *    0.933 *     0.276) +
          1.000 *    1.000 *     0.140) + =       0.397

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.276       0.140
Maximum flow rates at confluence using above data:
        0.410        0.397
Area of streams before confluence:
        0.125        0.065
Results of confluence:
Total flow rate =      0.410(CFS)
Time of concentration =    12.862 min.
Effective stream area after confluence =      0.190(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       47.000 to Point/Station       52.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   680.300(Ft.)
Downstream point/station elevation =   679.800(Ft.)
Pipe length  =     9.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.410(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.410(CFS)
Normal flow depth in pipe =    2.29(In.)
Flow top width inside pipe =    5.83(In.)
Critical Depth =    3.90(In.)
Pipe flow velocity =      5.94(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    12.89 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       52.000 to Point/Station       52.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
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The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.190(Ac.)
Runoff from this stream =      0.410(CFS)
Time of concentration =   12.89 min.
Rainfall intensity =     5.007(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       49.000 to Point/Station       49.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      5.243(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.00 min.  Rain intensity =       5.24(In/Hr)
Total area =        0.053(Ac.)  Total runoff =     0.140(CFS)


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Process from Point/Station       49.000 to Point/Station       50.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   687.300(Ft.)
Downstream point/station elevation =   684.300(Ft.)
Pipe length  =    86.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.140(CFS)
Nearest computed pipe diameter  =      3.00(In.)
Calculated individual pipe flow  =     0.140(CFS)
Normal flow depth in pipe =    2.11(In.)
Flow top width inside pipe =    2.74(In.)
Critical Depth =    2.66(In.)
Pipe flow velocity =      3.77(Ft/s)
Travel time through pipe =    0.38 min.
Time of concentration (TC) =    12.38 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       50.000 to Point/Station       50.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 3 in normal stream number 1
Stream flow area =      0.053(Ac.)
Runoff from this stream =      0.140(CFS)
Time of concentration =   12.38 min.
Rainfall intensity =     5.138(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       50.000 to Point/Station       50.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      5.243(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.00 min.  Rain intensity =       5.24(In/Hr)
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Total area =        0.064(Ac.)  Total runoff =     0.140(CFS)


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Process from Point/Station       50.000 to Point/Station       50.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      0.064(Ac.)
Runoff from this stream =      0.140(CFS)
Time of concentration =   12.00 min.
Rainfall intensity =     5.243(In/Hr)
Summary of stream data:

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


1        0.140     12.38               5.138
2        0.140     12.00               5.243
Qmax(1) =
          1.000 *    1.000 *     0.140) +
          0.980 *    1.000 *     0.140) + =       0.277
Qmax(2) =
          1.000 *    0.969 *     0.140) +
          1.000 *    1.000 *     0.140) + =       0.276

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.140       0.140
Maximum flow rates at confluence using above data:
        0.277        0.276
Area of streams before confluence:
        0.053        0.064
Results of confluence:
Total flow rate =      0.277(CFS)
Time of concentration =    12.380 min.
Effective stream area after confluence =      0.117(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       50.000 to Point/Station       51.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   684.300(Ft.)
Downstream point/station elevation =   680.300(Ft.)
Pipe length  =   108.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.277(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.277(CFS)
Normal flow depth in pipe =    2.07(In.)
Flow top width inside pipe =    5.71(In.)
Critical Depth =    3.19(In.)
Pipe flow velocity =      4.60(Ft/s)
Travel time through pipe =    0.39 min.
Time of concentration (TC) =    12.77 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       51.000 to Point/Station       51.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 3 in normal stream number 1
Stream flow area =      0.117(Ac.)
Runoff from this stream =      0.277(CFS)
Time of concentration =   12.77 min.
Rainfall intensity =     5.036(In/Hr)


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Process from Point/Station       51.000 to Point/Station       51.000
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**** USER DEFINED FLOW INFORMATION AT A POINT ****
____________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      5.243(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.00 min.  Rain intensity =       5.24(In/Hr)
Total area =        0.082(Ac.)  Total runoff =     0.110(CFS)


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Process from Point/Station       51.000 to Point/Station       51.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      0.082(Ac.)
Runoff from this stream =      0.110(CFS)
Time of concentration =   12.00 min.
Rainfall intensity =     5.243(In/Hr)
Summary of stream data:

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


1        0.277     12.77               5.036
2        0.110     12.00               5.243
Qmax(1) =
          1.000 *    1.000 *     0.277) +
          0.961 *    1.000 *     0.110) + =       0.383
Qmax(2) =
          1.000 *    0.940 *     0.277) +
          1.000 *    1.000 *     0.110) + =       0.370

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.277       0.110
Maximum flow rates at confluence using above data:
        0.383        0.370
Area of streams before confluence:
        0.117        0.082
Results of confluence:
Total flow rate =      0.383(CFS)
Time of concentration =    12.771 min.
Effective stream area after confluence =      0.199(Ac.)


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Process from Point/Station       51.000 to Point/Station       52.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________
Upstream point/station elevation =   680.300(Ft.)
Downstream point/station elevation =   679.800(Ft.)
Pipe length  =    37.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.383(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.383(CFS)
Normal flow depth in pipe =    3.30(In.)
Flow top width inside pipe =    5.97(In.)
Critical Depth =    3.77(In.)
Pipe flow velocity =      3.45(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =    12.95 min.
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       52.000 to Point/Station       52.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      0.199(Ac.)
Runoff from this stream =      0.383(CFS)
Time of concentration =   12.95 min.
Rainfall intensity =     4.992(In/Hr)
Summary of stream data:

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


1      131.200      8.31               6.643
2        0.410     12.89               5.007
3        0.383     12.95               4.992
Qmax(1) =
          1.000 *    1.000 *   131.200) +
          1.000 *    0.645 *     0.410) +
          1.000 *    0.642 *     0.383) + =     131.710
Qmax(2) =
          0.754 *    1.000 *   131.200) +
          1.000 *    1.000 *     0.410) +
          1.000 *    0.995 *     0.383) + =      99.685
Qmax(3) =
          0.751 *    1.000 *   131.200) +
          0.997 *    1.000 *     0.410) +
          1.000 *    1.000 *     0.383) + =      99.377

Total of 3 main streams to confluence:
Flow rates before confluence point:
     131.200       0.410       0.383
Maximum flow rates at confluence using above data:
      131.710       99.685       99.377
Area of streams before confluence:
       50.718        0.190        0.199


Results of confluence:
Total flow rate =    131.710(CFS)
Time of concentration =     8.314 min.
Effective stream area after confluence  =     51.107(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       52.000 to Point/Station       53.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   679.800(Ft.)
Downstream point/station elevation =   678.800(Ft.)
Pipe length  =    84.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   131.710(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =   131.710(CFS)
Normal flow depth in pipe =   36.84(In.)
Flow top width inside pipe =   34.67(In.)
Critical Depth =   40.85(In.)
Pipe flow velocity =     13.62(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     8.42 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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 =     51.107(Ac.)
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Runoff from this stream =    131.710(CFS)
Time of concentration =    8.42 min.
Rainfall intensity =     6.590(In/Hr)


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Process from Point/Station       53.000 to Point/Station       53.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      5.243(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.00 min.  Rain intensity =       5.24(In/Hr)
Total area =        0.066(Ac.)  Total runoff =     0.140(CFS)


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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 2
Stream flow area =      0.066(Ac.)
Runoff from this stream =      0.140(CFS)
Time of concentration =   12.00 min.
Rainfall intensity =     5.243(In/Hr)
Summary of stream data:

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


1      131.710      8.42               6.590
2        0.140     12.00               5.243
Qmax(1) =
          1.000 *    1.000 *   131.710) +
          1.000 *    0.701 *     0.140) + =     131.808
Qmax(2) =
          0.796 *    1.000 *   131.710) +
          1.000 *    1.000 *     0.140) + =     104.919

Total of 2 streams to confluence:
Flow rates before confluence point:
     131.710       0.140
Maximum flow rates at confluence using above data:
      131.808      104.919
Area of streams before confluence:
       51.107        0.066
Results of confluence:
Total flow rate =    131.808(CFS)
Time of concentration =     8.417 min.
Effective stream area after confluence =     51.173(Ac.)


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Process from Point/Station       53.000 to Point/Station       58.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   678.800(Ft.)
Downstream point/station elevation =   676.000(Ft.)
Pipe length  =    30.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   131.808(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =   131.808(CFS)
Normal flow depth in pipe =   22.64(In.)
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Flow top width inside pipe =   30.63(In.)
Critical depth could not be calculated.
Pipe flow velocity =     30.32(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =     8.43 min.


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Process from Point/Station       58.000 to Point/Station       58.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     51.173(Ac.)
Runoff from this stream =    131.808(CFS)
Time of concentration =    8.43 min.
Rainfall intensity =     6.582(In/Hr)


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Process from Point/Station       57.000 to Point/Station       57.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      5.243(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.00 min.  Rain intensity =       5.24(In/Hr)
Total area =        0.085(Ac.)  Total runoff =     0.110(CFS)


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Process from Point/Station       57.000 to Point/Station       58.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   678.500(Ft.)
Downstream point/station elevation =   676.000(Ft.)
Pipe length  =    35.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.110(CFS)
Nearest computed pipe diameter  =      3.00(In.)
Calculated individual pipe flow  =     0.110(CFS)
Normal flow depth in pipe =    1.43(In.)
Flow top width inside pipe =    3.00(In.)
Critical Depth =    2.40(In.)
Pipe flow velocity =      4.72(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =    12.12 min.


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Process from Point/Station       58.000 to Point/Station       58.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.085(Ac.)
Runoff from this stream =      0.110(CFS)
Time of concentration =   12.12 min.
Rainfall intensity =     5.208(In/Hr)
Summary of stream data:

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


1      131.808      8.43               6.582
2        0.110     12.12               5.208
```

```
Qmax(1) =
          1.000 *    1.000 *   131.808) +
          1.000 *    0.696 *     0.110) + =     131.885
Qmax(2) =
          0.791 *    1.000 *   131.808) +
          1.000 *    1.000 *     0.110) + =     104.408

Total of 2 streams to confluence:
Flow rates before confluence point:
     131.808       0.110
Maximum flow rates at confluence using above data:
      131.885      104.408
Area of streams before confluence:
       51.173        0.085
Results of confluence:
Total flow rate =    131.885(CFS)
Time of concentration =     8.433 min.
Effective stream area after confluence =     51.258(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       58.000 to Point/Station       54.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   676.000(Ft.)
Downstream point/station elevation =   675.500(Ft.)
Pipe length  =    56.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   131.885(CFS)
Nearest computed pipe diameter  =     48.00(In.)
Calculated individual pipe flow  =   131.885(CFS)
Normal flow depth in pipe =   38.16(In.)
Flow top width inside pipe =   38.76(In.)
Critical Depth =   41.18(In.)
Pipe flow velocity =     12.31(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =     8.51 min.


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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 =     51.258(Ac.)
Runoff from this stream =    131.885(CFS)
Time of concentration =    8.51 min.
Rainfall intensity =     6.544(In/Hr)


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Process from Point/Station       54.000 to Point/Station       54.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      5.243(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.00 min.  Rain intensity =       5.24(In/Hr)
Total area =        0.059(Ac.)  Total runoff =     0.140(CFS)


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Process from Point/Station       54.000 to Point/Station       54.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
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Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.059(Ac.)
Runoff from this stream =      0.140(CFS)
Time of concentration =   12.00 min.
Rainfall intensity =     5.243(In/Hr)
Summary of stream data:

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


1      131.885      8.51               6.544
2        0.140     12.00               5.243
Qmax(1) =
          1.000 *    1.000 *   131.885) +
          1.000 *    0.709 *     0.140) + =     131.984
Qmax(2) =
          0.801 *    1.000 *   131.885) +
          1.000 *    1.000 *     0.140) + =     105.799

Total of 2 streams to confluence:
Flow rates before confluence point:
     131.885       0.140
Maximum flow rates at confluence using above data:
      131.984      105.799
Area of streams before confluence:
       51.258        0.059
Results of confluence:
Total flow rate =    131.984(CFS)
Time of concentration =     8.509 min.
Effective stream area after confluence =     51.317(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       54.000 to Point/Station       59.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   675.500(Ft.)
Downstream point/station elevation =   673.000(Ft.)
Pipe length  =    80.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   131.984(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =   131.984(CFS)
Normal flow depth in pipe =   29.06(In.)
Flow top width inside pipe =   33.99(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.93(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =     8.58 min.


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Process from Point/Station       59.000 to Point/Station       59.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     51.317(Ac.)
Runoff from this stream =    131.984(CFS)
Time of concentration =    8.58 min.
Rainfall intensity =     6.511(In/Hr)


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Process from Point/Station       55.000 to Point/Station       55.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
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(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      5.243(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.00 min.  Rain intensity =       5.24(In/Hr)
Total area =        0.064(Ac.)  Total runoff =     0.140(CFS)


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Process from Point/Station       55.000 to Point/Station       59.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   673.500(Ft.)
Downstream point/station elevation =   673.000(Ft.)
Pipe length  =    10.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.140(CFS)
Nearest computed pipe diameter  =      3.00(In.)
Calculated individual pipe flow  =     0.140(CFS)
Normal flow depth in pipe =    1.86(In.)
Flow top width inside pipe =    2.91(In.)
Critical Depth =    2.66(In.)
Pipe flow velocity =      4.36(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    12.04 min.


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Process from Point/Station       59.000 to Point/Station       59.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.064(Ac.)
Runoff from this stream =      0.140(CFS)
Time of concentration =   12.04 min.
Rainfall intensity =     5.232(In/Hr)


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Process from Point/Station       58.000 to Point/Station       58.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      5.243(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.00 min.  Rain intensity =       5.24(In/Hr)
Total area =        0.108(Ac.)  Total runoff =     0.460(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       58.000 to Point/Station       59.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   673.500(Ft.)
Downstream point/station elevation =   673.000(Ft.)
Pipe length  =    35.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.460(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.460(CFS)
Normal flow depth in pipe =    3.64(In.)
Flow top width inside pipe =    5.86(In.)
Critical Depth =    4.15(In.)
Pipe flow velocity =      3.68(Ft/s)
Travel time through pipe =    0.16 min.
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Time of concentration (TC) =    12.16 min.


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Process from Point/Station       59.000 to Point/Station       59.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.108(Ac.)
Runoff from this stream =      0.460(CFS)
Time of concentration =   12.16 min.
Rainfall intensity =     5.199(In/Hr)
Summary of stream data:

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


1      131.984      8.58               6.511
2        0.140     12.04               5.232
3        0.460     12.16               5.199
Qmax(1) =
          1.000 *    1.000 *   131.984) +
          1.000 *    0.712 *     0.140) +
          1.000 *    0.705 *     0.460) + =     132.408
Qmax(2) =
          0.804 *    1.000 *   131.984) +
          1.000 *    1.000 *     0.140) +
          1.000 *    0.990 *     0.460) + =     106.652
Qmax(3) =
          0.798 *    1.000 *   131.984) +
          0.994 *    1.000 *     0.140) +
          1.000 *    1.000 *     0.460) + =     105.977

Total of 3 streams to confluence:
Flow rates before confluence point:
     131.984       0.140       0.460
Maximum flow rates at confluence using above data:
      132.408      106.652      105.977
Area of streams before confluence:
       51.317        0.064        0.108
Results of confluence:
Total flow rate =    132.408(CFS)
Time of concentration =     8.576 min.
Effective stream area after confluence =     51.489(Ac.)


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Process from Point/Station       59.000 to Point/Station       62.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   673.000(Ft.)
Downstream point/station elevation =   663.000(Ft.)
Pipe length  =   223.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   132.408(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =   132.408(CFS)
Normal flow depth in pipe =   27.66(In.)
Flow top width inside pipe =   30.38(In.)
Critical depth could not be calculated.
Pipe flow velocity =     22.71(Ft/s)
Travel time through pipe =    0.16 min.
Time of concentration (TC) =     8.74 min.


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Process from Point/Station       62.000 to Point/Station       62.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
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```
Stream flow area =     51.489(Ac.)
Runoff from this stream =    132.408(CFS)
Time of concentration =    8.74 min.
Rainfall intensity =     6.432(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       56.000 to Point/Station       56.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      5.243(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.00 min.  Rain intensity =       5.24(In/Hr)
Total area =        0.170(Ac.)  Total runoff =     0.110(CFS)


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Process from Point/Station       56.000 to Point/Station       62.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   664.300(Ft.)
Downstream point/station elevation =   663.000(Ft.)
Pipe length  =     5.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.110(CFS)
Nearest computed pipe diameter  =      3.00(In.)
Calculated individual pipe flow  =     0.110(CFS)
Normal flow depth in pipe =    1.01(In.)
Flow top width inside pipe =    2.84(In.)
Critical Depth =    2.40(In.)
Pipe flow velocity =      7.59(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =    12.01 min.


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Process from Point/Station       62.000 to Point/Station       62.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.170(Ac.)
Runoff from this stream =      0.110(CFS)
Time of concentration =   12.01 min.
Rainfall intensity =     5.240(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       60.000 to Point/Station       60.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      5.243(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.00 min.  Rain intensity =       5.24(In/Hr)
```

```
Total area =        0.080(Ac.)  Total runoff =     0.110(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       60.000 to Point/Station       61.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   668.300(Ft.)
Downstream point/station elevation =   664.300(Ft.)
Pipe length  =    88.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.110(CFS)
Nearest computed pipe diameter  =      3.00(In.)
Calculated individual pipe flow  =     0.110(CFS)
Normal flow depth in pipe =    1.65(In.)
Flow top width inside pipe =    2.99(In.)
Critical Depth =    2.40(In.)
Pipe flow velocity =      3.98(Ft/s)
Travel time through pipe =    0.37 min.
Time of concentration (TC) =    12.37 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       61.000 to Point/Station       61.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 3 in normal stream number 1
Stream flow area =      0.080(Ac.)
Runoff from this stream =      0.110(CFS)
Time of concentration =   12.37 min.
Rainfall intensity =     5.142(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       61.000 to Point/Station       61.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      5.243(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.00 min.  Rain intensity =       5.24(In/Hr)
Total area =        0.067(Ac.)  Total runoff =     0.140(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       61.000 to Point/Station       61.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      0.067(Ac.)
Runoff from this stream =      0.140(CFS)
Time of concentration =   12.00 min.
Rainfall intensity =     5.243(In/Hr)
Summary of stream data:

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


1        0.110     12.37               5.142
2        0.140     12.00               5.243
Qmax(1) =
          1.000 *    1.000 *     0.110) +
          0.981 *    1.000 *     0.140) + =       0.247
Qmax(2) =
```

```
          1.000 *    0.970 *     0.110) +
          1.000 *    1.000 *     0.140) + =       0.247

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.110       0.140
Maximum flow rates at confluence using above data:
        0.247        0.247
Area of streams before confluence:
        0.080        0.067
Results of confluence:
Total flow rate =      0.247(CFS)
Time of concentration =    12.368 min.
Effective stream area after confluence =      0.147(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       61.000 to Point/Station       62.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   664.300(Ft.)
Downstream point/station elevation =   663.000(Ft.)
Pipe length  =    38.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.247(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.247(CFS)
Normal flow depth in pipe =    2.00(In.)
Flow top width inside pipe =    5.65(In.)
Critical Depth =    3.00(In.)
Pipe flow velocity =      4.34(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =    12.51 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       62.000 to Point/Station       62.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      0.147(Ac.)
Runoff from this stream =      0.247(CFS)
Time of concentration =   12.51 min.
Rainfall intensity =     5.103(In/Hr)
Summary of stream data:

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


1      132.408      8.74               6.432
2        0.110     12.01               5.240
3        0.247     12.51               5.103
Qmax(1) =
          1.000 *    1.000 *   132.408) +
          1.000 *    0.728 *     0.110) +
          1.000 *    0.698 *     0.247) + =     132.661
Qmax(2) =
          0.815 *    1.000 *   132.408) +
          1.000 *    1.000 *     0.110) +
          1.000 *    0.960 *     0.247) + =     108.207
Qmax(3) =
          0.793 *    1.000 *   132.408) +
          0.974 *    1.000 *     0.110) +
          1.000 *    1.000 *     0.247) + =     105.397

Total of 3 main streams to confluence:
Flow rates before confluence point:
     132.408       0.110       0.247
Maximum flow rates at confluence using above data:
      132.661      108.207      105.397
```

```
Area of streams before confluence:
       51.489        0.170        0.147


Results of confluence:
Total flow rate =    132.661(CFS)
Time of concentration =     8.740 min.
Effective stream area after confluence  =     51.806(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       62.000 to Point/Station       29.100
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   663.000(Ft.)
Downstream point/station elevation =   662.500(Ft.)
Pipe length  =    34.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   132.661(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =   132.661(CFS)
Normal flow depth in pipe =   33.52(In.)
Flow top width inside pipe =   39.24(In.)
Critical Depth =   40.96(In.)
Pipe flow velocity =     15.04(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =     8.78 min.
End of computations, total study area =          51.806 (Ac.)
```

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2004 Version 7.4

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
       Rational Hydrology Study        Date: 02/10/13
----------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

----------------------------------------------------------------------
File: 12052POSTD.RD3

Program License Serial Number 4012

----------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      301.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  756.000(Ft.)
Highest elevation =  905.000(Ft.)
Lowest elevation =  780.000(Ft.)
Elevation difference =  125.000(Ft.) Slope = 16.534 %
Top of Initial Area Slope adjusted by User to 25.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  25.00 %, in a development type of
 Permanent Open Space
In Accordance With Table 3-2
Initial Area Time of Concentration =   6.90 minutes
 (for slope value of  10.00 %)
Rainfall intensity (I) =      7.492(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =     59.236(CFS)
Total initial stream area =       22.591(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =     78.088(CFS)
Depth of flow =   1.218(Ft.), Average velocity =   6.583(Ft/s)
       ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              5.00
       2             40.00              0.00
       3             80.00              5.00
Manning's 'N' friction factor =   0.045
```

```
----------------------------------------------------------------
Sub-Channel flow  =     78.088(CFS)
  '     '       flow top width =     19.484(Ft.)
  '     '    velocity=    6.583(Ft/s)
  '     '       area =     11.863(Sq.Ft)
  '     '       Froude number =     1.487

Upstream point elevation =   780.000(Ft.)
Downstream point elevation =   705.000(Ft.)
Flow length =   964.000(Ft.)
Travel time  =    2.44 min.
Time of concentration =    9.34 min.
Depth of flow =   1.218(Ft.)
Average velocity =   6.583(Ft/s)
Total irregular channel flow =    78.088(CFS)
Irregular channel normal depth above invert elev. =   1.218(Ft.)
Average velocity of channel(s) =   6.583(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      6.162(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =     15.715
Subarea runoff =     37.607(CFS) for     22.310(Ac.)
Total runoff =     96.843(CFS)        Total area =      44.901(Ac.)
Depth of flow =   1.320(Ft.), Average velocity =   6.947(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      145.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   702.000(Ft.)
Downstream point/station elevation =   699.200(Ft.)
Pipe length  =   276.50(Ft.)   Manning's N = 0.013
No. of pipes = 3  Required pipe flow  =    96.843(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    32.281(CFS)
Normal flow depth in pipe =   19.97(In.)
Flow top width inside pipe =   28.31(In.)
Critical Depth =   23.23(In.)
Pipe flow velocity =      9.30(Ft/s)
Travel time through pipe =    0.50 min.
Time of concentration (TC) =     9.84 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      145.000 to Point/Station      145.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     44.901(Ac.)
Runoff from this stream =     96.843(CFS)
Time of concentration =    9.84 min.
Rainfall intensity =     5.960(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      140.000 to Point/Station      141.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
```

```
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  204.000(Ft.)
Highest elevation =  717.000(Ft.)
Lowest elevation =  716.000(Ft.)
Elevation difference =    1.000(Ft.) Slope =  0.490 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 50.00 (Ft)
for the top area slope value of   0.49 %, in a development type of
 10.9 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =   8.70 minutes
 (for slope value of   0.50 %)
Rainfall intensity (I) =      6.451(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      2.353(CFS)
Total initial stream area =        0.608(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      141.000 to Point/Station      142.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   714.000(Ft.)
Downstream point/station elevation =   713.000(Ft.)
Pipe length  =   170.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.353(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.353(CFS)
Normal flow depth in pipe =    8.59(In.)
Flow top width inside pipe =   10.82(In.)
Critical Depth =    7.88(In.)
Pipe flow velocity =      3.91(Ft/s)
Travel time through pipe =    0.72 min.
Time of concentration (TC) =     9.42 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      142.000 to Point/Station      142.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     9.42 min.
Rainfall intensity =      6.127(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.612
Subarea runoff =      1.396(CFS) for      0.412(Ac.)
Total runoff =      3.750(CFS)        Total area =       1.020(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      142.000 to Point/Station      143.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   713.000(Ft.)
Downstream point/station elevation =   712.500(Ft.)
Pipe length  =    40.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.750(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     3.750(CFS)
Normal flow depth in pipe =    9.26(In.)
Flow top width inside pipe =   10.08(In.)
```

```
Critical Depth =    9.89(In.)
Pipe flow velocity =      5.77(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =     9.54 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      143.000 to Point/Station      144.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      3.882(CFS)
Depth of flow =   0.123(Ft.), Average velocity =   2.072(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              2.00
       2              4.00              0.00
       3             19.00              0.00
       4             23.00              2.00
Manning's 'N' friction factor =   0.030
----------------------------------------------------------------
Sub-Channel flow  =      3.882(CFS)
  '     '       flow top width =     15.492(Ft.)
  '     '    velocity=    2.072(Ft/s)
  '     '       area =      1.873(Sq.Ft)
  '     '       Froude number =     1.050

Upstream point elevation =   712.500(Ft.)
Downstream point elevation =   712.000(Ft.)
Flow length =    17.000(Ft.)
Travel time  =    0.14 min.
Time of concentration =    9.68 min.
Depth of flow =   0.123(Ft.)
Average velocity =   2.072(Ft/s)
Total irregular channel flow =     3.882(CFS)
Irregular channel normal depth above invert elev. =   0.123(Ft.)
Average velocity of channel(s) =   2.072(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity =      6.024(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.655
Subarea runoff =      0.197(CFS) for      0.072(Ac.)
Total runoff =      3.947(CFS)        Total area =       1.092(Ac.)
Depth of flow =   0.124(Ft.), Average velocity =   2.086(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      144.000 to Point/Station      145.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   710.000(Ft.)
Downstream point/station elevation =   699.200(Ft.)
Pipe length  =    66.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.947(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     3.947(CFS)
Normal flow depth in pipe =    4.97(In.)
Flow top width inside pipe =    8.95(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.77(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =     9.75 min.
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      145.000 to Point/Station      145.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.092(Ac.)
Runoff from this stream =      3.947(CFS)
Time of concentration =    9.75 min.
Rainfall intensity =     5.996(In/Hr)
Summary of stream data:

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


1       96.843      9.84               5.960
2        3.947      9.75               5.996
Qmax(1) =
          1.000 *    1.000 *    96.843) +
          0.994 *    1.000 *     3.947) + =     100.766
Qmax(2) =
          1.000 *    0.991 *    96.843) +
          1.000 *    1.000 *     3.947) + =      99.903

Total of 2 streams to confluence:
Flow rates before confluence point:
      96.843       3.947
Maximum flow rates at confluence using above data:
      100.766       99.903
Area of streams before confluence:
       44.901        1.092
Results of confluence:
Total flow rate =    100.766(CFS)
Time of concentration =     9.836 min.
Effective stream area after confluence =     45.993(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      145.000 to Point/Station       72.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   699.200(Ft.)
Downstream point/station elevation =   698.500(Ft.)
Pipe length  =    74.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   100.766(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =   100.766(CFS)
Normal flow depth in pipe =   32.06(In.)
Flow top width inside pipe =   40.73(In.)
Critical Depth =   36.88(In.)
Pipe flow velocity =     11.97(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     9.94 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       72.000 to Point/Station       72.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     45.993(Ac.)
Runoff from this stream =    100.766(CFS)
Time of concentration =    9.94 min.
Rainfall intensity =     5.920(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       70.000 to Point/Station       72.000
**** INITIAL AREA EVALUATION ****
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  254.000(Ft.)
Highest elevation =  714.000(Ft.)
Lowest elevation =  710.000(Ft.)
Elevation difference =    4.000(Ft.) Slope =  1.575 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 80.00 (Ft)
for the top area slope value of   1.58 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.92 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  80.000^.5)/(   1.575^(1/3)]=   6.92
Rainfall intensity (I) =      7.479(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      1.032(CFS)
Total initial stream area =        0.230(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       72.000 to Point/Station       72.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.230(Ac.)
Runoff from this stream =      1.032(CFS)
Time of concentration =    6.92 min.
Rainfall intensity =     7.479(In/Hr)
Summary of stream data:

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


1      100.766      9.94               5.920
2        1.032      6.92               7.479
Qmax(1) =
          1.000 *    1.000 *   100.766) +
          0.792 *    1.000 *     1.032) + =     101.583
Qmax(2) =
          1.000 *    0.696 *   100.766) +
          1.000 *    1.000 *     1.032) + =      71.176

Total of 2 streams to confluence:
Flow rates before confluence point:
     100.766       1.032
Maximum flow rates at confluence using above data:
      101.583       71.176
Area of streams before confluence:
       45.993        0.230
Results of confluence:
Total flow rate =    101.583(CFS)
Time of concentration =     9.939 min.
Effective stream area after confluence =     46.223(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       72.000 to Point/Station       73.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   698.500(Ft.)
Downstream point/station elevation =   698.000(Ft.)
Pipe length  =    53.00(Ft.)   Manning's N = 0.013
```

```
No. of pipes = 1  Required pipe flow  =   101.583(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =   101.583(CFS)
Normal flow depth in pipe =   32.30(In.)
Flow top width inside pipe =   40.51(In.)
Critical Depth =   37.02(In.)
Pipe flow velocity =     11.97(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    10.01 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       73.000 to Point/Station       73.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     46.223(Ac.)
Runoff from this stream =    101.583(CFS)
Time of concentration =   10.01 min.
Rainfall intensity =     5.892(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       70.000 to Point/Station       71.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  278.000(Ft.)
Highest elevation =  714.000(Ft.)
Lowest elevation =  708.000(Ft.)
Elevation difference =    6.000(Ft.) Slope =  2.158 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 80.00 (Ft)
for the top area slope value of   2.16 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.23 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  80.000^.5)/(   2.158^(1/3)]=   6.23
Rainfall intensity (I) =      8.003(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      1.200(CFS)
Total initial stream area =        0.250(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       71.000 to Point/Station       73.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   703.500(Ft.)
Downstream point/station elevation =   698.000(Ft.)
Pipe length  =    37.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.200(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.200(CFS)
Normal flow depth in pipe =    3.19(In.)
Flow top width inside pipe =    5.99(In.)
Critical depth could not be calculated.
Pipe flow velocity =     11.30(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =     6.28 min.


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Process from Point/Station       73.000 to Point/Station       73.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.250(Ac.)
Runoff from this stream =      1.200(CFS)
Time of concentration =    6.28 min.
Rainfall intensity =     7.958(In/Hr)
Summary of stream data:

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


1      101.583     10.01               5.892
2        1.200      6.28               7.958
Qmax(1) =
          1.000 *    1.000 *   101.583) +
          0.740 *    1.000 *     1.200) + =     102.472
Qmax(2) =
          1.000 *    0.628 *   101.583) +
          1.000 *    1.000 *     1.200) + =      64.951

Total of 2 streams to confluence:
Flow rates before confluence point:
     101.583       1.200
Maximum flow rates at confluence using above data:
      102.472       64.951
Area of streams before confluence:
       46.223        0.250
Results of confluence:
Total flow rate =    102.472(CFS)
Time of concentration =    10.013 min.
Effective stream area after confluence =     46.473(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       73.000 to Point/Station       74.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________
Upstream point/station elevation =   698.000(Ft.)
Downstream point/station elevation =   696.000(Ft.)
Pipe length  =   197.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   102.472(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =   102.472(CFS)
Normal flow depth in pipe =   31.59(In.)
Flow top width inside pipe =   41.16(In.)
Critical Depth =   37.16(In.)
Pipe flow velocity =     12.36(Ft/s)
Travel time through pipe =    0.27 min.
Time of concentration (TC) =    10.28 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       74.000 to Point/Station       74.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     46.473(Ac.)
Runoff from this stream =    102.472(CFS)
Time of concentration =   10.28 min.
Rainfall intensity =     5.794(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      304.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
```

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Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =   84.000(Ft.)
Highest elevation =  772.000(Ft.)
Lowest elevation =  755.000(Ft.)
Elevation difference =   17.000(Ft.) Slope = 20.238 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  20.24 %, in a development type of
 Permanent Open Space
In Accordance With Table 3-2
Initial Area Time of Concentration =   6.90 minutes
 (for slope value of  10.00 %)
Rainfall intensity (I) =      7.492(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      1.030(CFS)
Total initial stream area =        0.393(Ac.)


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Process from Point/Station      304.000 to Point/Station      305.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      4.261(CFS)
Depth of flow =   0.191(Ft.), Average velocity =   2.345(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              2.00
       2            100.00              0.00
       3            200.00              2.00
Manning's 'N' friction factor =   0.045
----------------------------------------------------------------
Sub-Channel flow  =      4.261(CFS)
  '     '       flow top width =     19.062(Ft.)
  '     '    velocity=    2.345(Ft/s)
  '     '       area =      1.817(Sq.Ft)
  '     '       Froude number =     1.339

Upstream point elevation =   755.000(Ft.)
Downstream point elevation =   704.000(Ft.)
Flow length =   440.000(Ft.)
Travel time  =    3.13 min.
Time of concentration =   10.03 min.
Depth of flow =   0.191(Ft.)
Average velocity =   2.345(Ft/s)
Total irregular channel flow =     4.261(CFS)
Irregular channel normal depth above invert elev. =   0.191(Ft.)
Average velocity of channel(s) =   2.345(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      5.887(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      1.260
Subarea runoff =      6.387(CFS) for      3.207(Ac.)
Total runoff =      7.418(CFS)        Total area =       3.600(Ac.)
Depth of flow =   0.235(Ft.), Average velocity =   2.694(Ft/s)
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Process from Point/Station      305.000 to Point/Station       74.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   701.000(Ft.)
Downstream point/station elevation =   696.000(Ft.)
Pipe length  =   114.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.418(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     7.418(CFS)
Normal flow depth in pipe =    9.77(In.)
Flow top width inside pipe =    9.33(In.)
Critical depth could not be calculated.
Pipe flow velocity =     10.83(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =    10.20 min.


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Process from Point/Station       74.000 to Point/Station       74.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.600(Ac.)
Runoff from this stream =      7.418(CFS)
Time of concentration =   10.20 min.
Rainfall intensity =     5.822(In/Hr)
Summary of stream data:

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


1      102.472     10.28               5.794
2        7.418     10.20               5.822
Qmax(1) =
          1.000 *    1.000 *   102.472) +
          0.995 *    1.000 *     7.418) + =     109.854
Qmax(2) =
          1.000 *    0.993 *   102.472) +
          1.000 *    1.000 *     7.418) + =     109.127

Total of 2 streams to confluence:
Flow rates before confluence point:
     102.472       7.418
Maximum flow rates at confluence using above data:
      109.854      109.127
Area of streams before confluence:
       46.473        3.600
Results of confluence:
Total flow rate =    109.854(CFS)
Time of concentration =    10.279 min.
Effective stream area after confluence =     50.073(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       74.000 to Point/Station       75.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   696.000(Ft.)
Downstream point/station elevation =   695.500(Ft.)
Pipe length  =    50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   109.854(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =   109.854(CFS)
Normal flow depth in pipe =   33.66(In.)
Flow top width inside pipe =   39.08(In.)
Critical Depth =   38.29(In.)
Pipe flow velocity =     12.41(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    10.35 min.
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       75.000 to Point/Station       75.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     50.073(Ac.)
Runoff from this stream =    109.854(CFS)
Time of concentration =   10.35 min.
Rainfall intensity =     5.769(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       72.000 to Point/Station       75.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  300.000(Ft.)
Highest elevation =  710.000(Ft.)
Lowest elevation =  701.500(Ft.)
Elevation difference =    8.500(Ft.) Slope =  2.833 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   2.83 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.03 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  90.000^.5)/(   2.833^(1/3)]=   6.03
Rainfall intensity (I) =      8.169(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      1.103(CFS)
Total initial stream area =        0.225(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       75.000 to Point/Station       75.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.225(Ac.)
Runoff from this stream =      1.103(CFS)
Time of concentration =    6.03 min.
Rainfall intensity =     8.169(In/Hr)
Summary of stream data:

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


1      109.854     10.35               5.769
2        1.103      6.03               8.169
Qmax(1) =
          1.000 *    1.000 *   109.854) +
          0.706 *    1.000 *     1.103) + =     110.633
Qmax(2) =
          1.000 *    0.583 *   109.854) +
          1.000 *    1.000 *     1.103) + =      65.175

Total of 2 streams to confluence:
Flow rates before confluence point:
     109.854       1.103
Maximum flow rates at confluence using above data:
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```
      110.633       65.175
Area of streams before confluence:
       50.073        0.225
Results of confluence:
Total flow rate =    110.633(CFS)
Time of concentration =    10.346 min.
Effective stream area after confluence =     50.298(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       75.000 to Point/Station       77.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   695.500(Ft.)
Downstream point/station elevation =   693.500(Ft.)
Pipe length  =   106.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   110.633(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =   110.633(CFS)
Normal flow depth in pipe =   31.13(In.)
Flow top width inside pipe =   31.31(In.)
Critical Depth =   37.02(In.)
Pipe flow velocity =     15.58(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    10.46 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 =     50.298(Ac.)
Runoff from this stream =    110.633(CFS)
Time of concentration =   10.46 min.
Rainfall intensity =     5.729(In/Hr)


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Process from Point/Station       71.000 to Point/Station       76.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  339.000(Ft.)
Highest elevation =  708.000(Ft.)
Lowest elevation =  698.500(Ft.)
Elevation difference =    9.500(Ft.) Slope =  2.802 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   2.80 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.06 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  90.000^.5)/(   2.802^(1/3)]=   6.06
Rainfall intensity (I) =      8.149(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      1.335(CFS)
Total initial stream area =        0.273(Ac.)


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Process from Point/Station       76.000 to Point/Station       77.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
```

```
Upstream point/station elevation =   694.000(Ft.)
Downstream point/station elevation =   693.500(Ft.)
Pipe length  =    37.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.335(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.335(CFS)
Normal flow depth in pipe =    5.52(In.)
Flow top width inside pipe =    8.77(In.)
Critical Depth =    6.39(In.)
Pipe flow velocity =      4.70(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =     6.19 min.


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Process from Point/Station       77.000 to Point/Station       77.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.273(Ac.)
Runoff from this stream =      1.335(CFS)
Time of concentration =    6.19 min.
Rainfall intensity =     8.037(In/Hr)
Summary of stream data:

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


1      110.633     10.46               5.729
2        1.335      6.19               8.037
Qmax(1) =
          1.000 *    1.000 *   110.633) +
          0.713 *    1.000 *     1.335) + =     111.584
Qmax(2) =
          1.000 *    0.592 *   110.633) +
          1.000 *    1.000 *     1.335) + =      66.784

Total of 2 streams to confluence:
Flow rates before confluence point:
     110.633       1.335
Maximum flow rates at confluence using above data:
      111.584       66.784
Area of streams before confluence:
       50.298        0.273
Results of confluence:
Total flow rate =    111.584(CFS)
Time of concentration =    10.459 min.
Effective stream area after confluence =     50.571(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       77.000 to Point/Station       80.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   693.500(Ft.)
Downstream point/station elevation =   686.500(Ft.)
Pipe length  =   185.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   111.584(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =   111.584(CFS)
Normal flow depth in pipe =   25.73(In.)
Flow top width inside pipe =   32.51(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.64(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =    10.61 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 =     50.571(Ac.)
Runoff from this stream =    111.584(CFS)
Time of concentration =   10.61 min.
Rainfall intensity =     5.677(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       76.000 to Point/Station       78.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  181.000(Ft.)
Highest elevation =  698.500(Ft.)
Lowest elevation =  693.000(Ft.)
Elevation difference =    5.500(Ft.) Slope =  3.039 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   3.04 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.89 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  90.000^.5)/(   3.039^(1/3)]=   5.89
Rainfall intensity (I) =      8.293(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.776(CFS)
Total initial stream area =        0.156(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       78.000 to Point/Station       79.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________________
Upstream point/station elevation =   688.500(Ft.)
Downstream point/station elevation =   688.000(Ft.)
Pipe length  =    37.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.776(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.776(CFS)
Normal flow depth in pipe =    3.98(In.)
Flow top width inside pipe =    8.94(In.)
Critical Depth =    4.82(In.)
Pipe flow velocity =      4.12(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =     6.04 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       79.000 to Point/Station       79.000
**** SUBAREA FLOW ADDITION ****
____________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.04 min.
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Rainfall intensity =      8.160(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.226
Subarea runoff =      1.070(CFS) for      0.221(Ac.)
Total runoff =      1.846(CFS)        Total area =       0.377(Ac.)


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Process from Point/Station       79.000 to Point/Station       80.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   688.000(Ft.)
Downstream point/station elevation =   686.500(Ft.)
Pipe length  =   150.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.846(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     1.846(CFS)
Normal flow depth in pipe =    6.13(In.)
Flow top width inside pipe =   12.00(In.)
Critical Depth =    6.95(In.)
Pipe flow velocity =      4.58(Ft/s)
Travel time through pipe =    0.55 min.
Time of concentration (TC) =     6.59 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 2
Stream flow area =      0.377(Ac.)
Runoff from this stream =      1.846(CFS)
Time of concentration =    6.59 min.
Rainfall intensity =     7.717(In/Hr)
Summary of stream data:

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


1      111.584     10.61               5.677
2        1.846      6.59               7.717
Qmax(1) =
          1.000 *    1.000 *   111.584) +
          0.736 *    1.000 *     1.846) + =     112.942
Qmax(2) =
          1.000 *    0.621 *   111.584) +
          1.000 *    1.000 *     1.846) + =      71.167

Total of 2 streams to confluence:
Flow rates before confluence point:
     111.584       1.846
Maximum flow rates at confluence using above data:
      112.942       71.167
Area of streams before confluence:
       50.571        0.377
Results of confluence:
Total flow rate =    112.942(CFS)
Time of concentration =    10.609 min.
Effective stream area after confluence =     50.948(Ac.)
End of computations, total study area =          50.948 (Ac.)
```

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2004 Version 7.4

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
       Rational Hydrology Study        Date: 01/31/13
----------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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


Program License Serial Number 4012

----------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      140.000 to Point/Station      141.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  204.000(Ft.)
Highest elevation =  717.000(Ft.)
Lowest elevation =  716.000(Ft.)
Elevation difference =    1.000(Ft.) Slope =  0.490 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 50.00 (Ft)
for the top area slope value of   0.49 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   8.07 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  50.000^.5)/(   0.490^(1/3)]=   8.07
Rainfall intensity (I) =      6.771(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      2.470(CFS)
Total initial stream area =        0.608(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      141.000 to Point/Station      142.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   714.000(Ft.)
Downstream point/station elevation =   713.000(Ft.)
Pipe length  =   170.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.470(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.470(CFS)
Normal flow depth in pipe =    8.93(In.)
Flow top width inside pipe =   10.47(In.)
Critical Depth =    8.07(In.)
Pipe flow velocity =      3.94(Ft/s)
```

```
Travel time through pipe =    0.72 min.
Time of concentration (TC) =     8.79 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      142.000 to Point/Station      142.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.79 min.
Rainfall intensity =      6.408(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.612
Subarea runoff =      1.452(CFS) for      0.412(Ac.)
Total runoff =      3.922(CFS)        Total area =       1.020(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      142.000 to Point/Station      143.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   713.000(Ft.)
Downstream point/station elevation =   712.500(Ft.)
Pipe length  =    40.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.922(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     3.922(CFS)
Normal flow depth in pipe =    9.68(In.)
Flow top width inside pipe =    9.48(In.)
Critical Depth =   10.08(In.)
Pipe flow velocity =      5.78(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =     8.91 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      143.000 to Point/Station      144.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      4.060(CFS)
Depth of flow =   0.126(Ft.), Average velocity =   2.109(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              2.00
       2              4.00              0.00
       3             19.00              0.00
       4             23.00              2.00
Manning's 'N' friction factor =   0.030
-----------------------------------------------------------------
Sub-Channel flow  =      4.060(CFS)
  '     '       flow top width =     15.505(Ft.)
  '     '    velocity=    2.109(Ft/s)
  '     '       area =      1.925(Sq.Ft)
  '     '       Froude number =     1.055

Upstream point elevation =   712.500(Ft.)
Downstream point elevation =   712.000(Ft.)
Flow length =    17.000(Ft.)
Travel time  =    0.13 min.
Time of concentration =    9.04 min.
Depth of flow =   0.126(Ft.)
Average velocity =   2.109(Ft/s)
```

```
Total irregular channel flow =     4.060(CFS)
Irregular channel normal depth above invert elev. =   0.126(Ft.)
Average velocity of channel(s) =   2.109(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity =      6.293(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.655
Subarea runoff =      0.202(CFS) for      0.072(Ac.)
Total runoff =      4.123(CFS)        Total area =       1.092(Ac.)
Depth of flow =   0.127(Ft.), Average velocity =   2.122(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      144.000 to Point/Station      145.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   710.000(Ft.)
Downstream point/station elevation =   708.000(Ft.)
Pipe length  =    66.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.123(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     4.123(CFS)
Normal flow depth in pipe =    7.15(In.)
Flow top width inside pipe =   11.78(In.)
Critical Depth =   10.29(In.)
Pipe flow velocity =      8.45(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =     9.17 min.
End of computations, total study area =           1.092 (Ac.)
```

# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

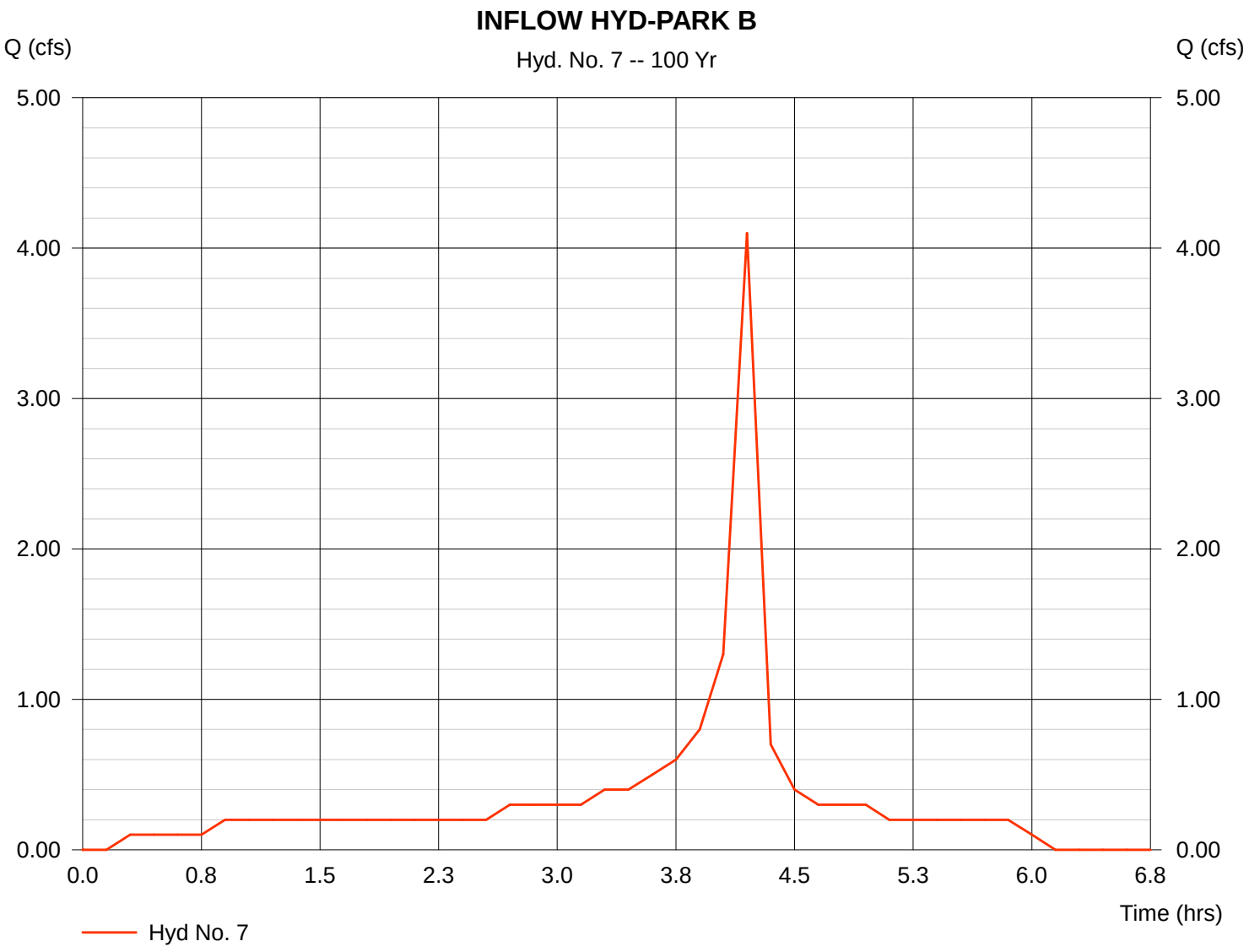
Monday, Jul 22 2013, 10:10 AM

## Hyd. No. 7

INFLOW HYD-PARK B

| | | | |
|---|---|---|---|
| Hydrograph type | = Manual | Peak discharge | = 4.10 cfs |
| Storm frequency | = 100 yrs | Time interval | = 9 min |

Hydrograph Volume = 8,316 cuft



# Hydrograph Plot

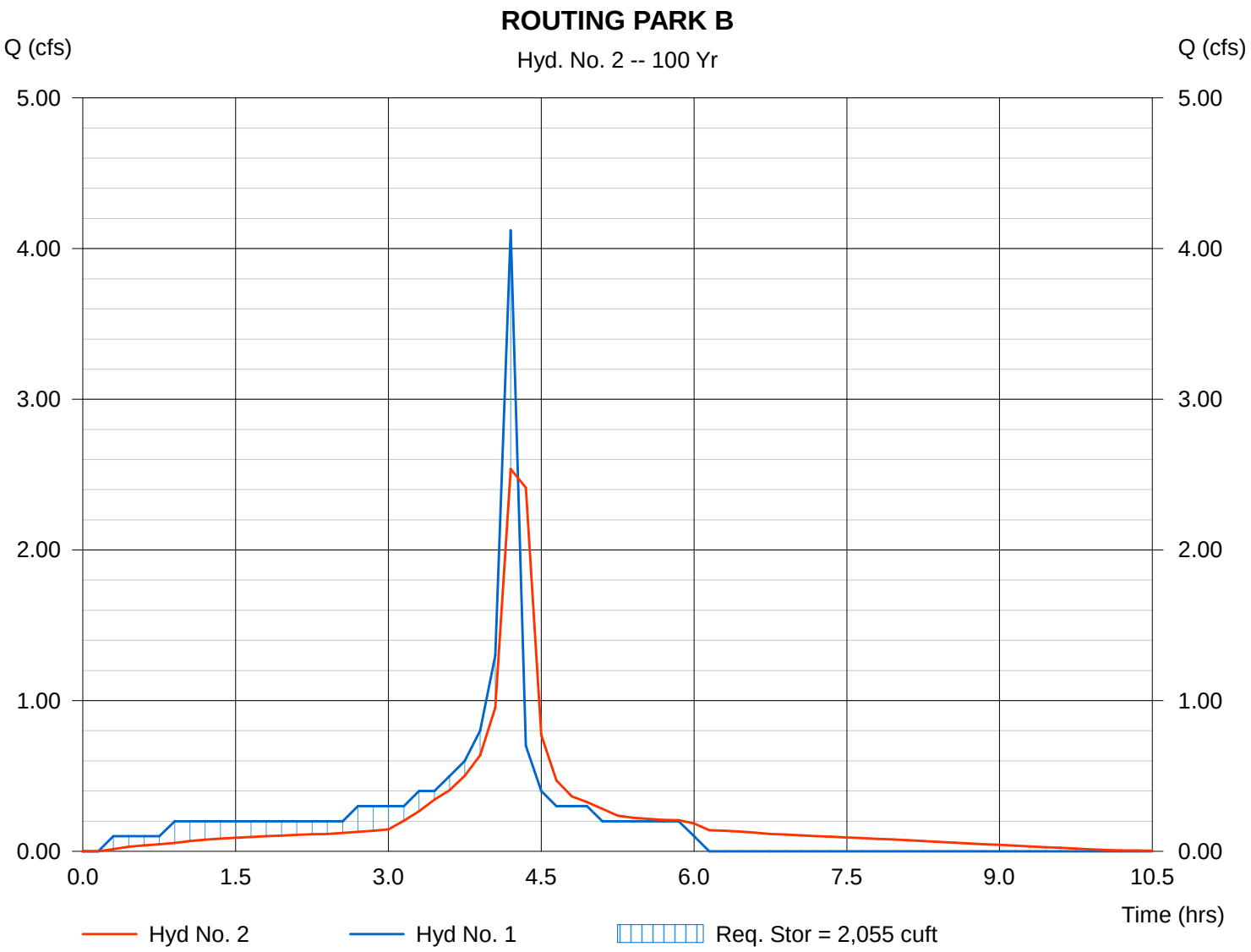
Hydraflow Hydrographs by Intelisolve | Monday, Jul 22 2013, 10:13 AM

## Hyd. No. 2

ROUTING PARK B

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph type | = | Reservoir | Peak discharge | = | 2.54 cfs |
| Storm frequency | = | 100 yrs | Time interval | = | 9 min |
| Inflow hyd. No. | = | 1 | Max. Elevation | = | 5.77 ft |
| Reservoir name | = | PARK B POND | Max. Storage | = | 2,055 cuft |

Storage Indication method used. | Hydrograph Volume = 8,325 cuft



# Pond Report

Hydraflow Hydrographs by Intelisolve | Monday, Jul 22 2013, 10:14 AM

## Pond No. 1 - PARK B POND

## Pond Data

Pond storage is based on known values

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|---|---|---|---|---|
| 0.00 | 0.00 | 00 | 0 | 0 |
| 2.00 | 2.00 | 00 | 357 | 357 |
| 4.00 | 4.00 | 00 | 408 | 765 |
| 4.50 | 4.50 | 00 | 281 | 1,046 |
| 6.00 | 6.00 | 00 | 1,196 | 2,242 |

### Culvert / Orifice Structures

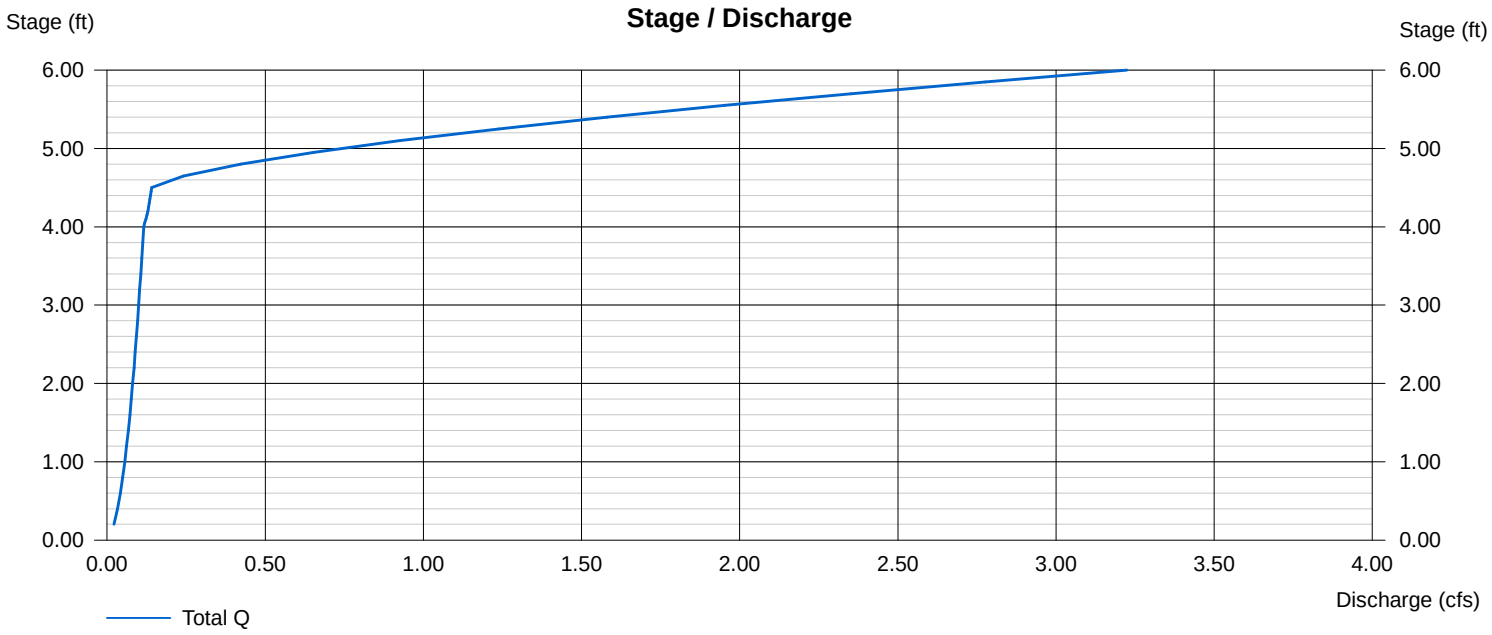
| | | [A] | [B] | [C] | [D] |
|---|---|---|---|---|---|
| **Rise (in)** | = | 12.00 | 1.50 | 1.00 | 0.00 |
| **Span (in)** | = | 12.00 | 1.50 | 1.00 | 0.00 |
| **No. Barrels** | = | 1 | 1 | 1 | 0 |
| **Invert El. (ft)** | = | 0.00 | 0.00 | 4.00 | 0.00 |
| **Length (ft)** | = | 66.00 | 0.00 | 0.00 | 0.00 |
| **Slope (%)** | = | 13.00 | 0.00 | 0.00 | 0.00 |
| **N-Value** | = | .013 | .013 | .013 | .013 |
| **Orif. Coeff.** | = | 0.60 | 0.60 | 0.60 | 0.60 |
| **Multi-Stage** | = | n/a | Yes | Yes | No |

### Weir Structures

| | | [A] | [B] | [C] | [D] |
|---|---|---|---|---|---|
| **Crest Len (ft)** | = | 0.50 | 0.00 | 0.00 | 0.00 |
| **Crest El. (ft)** | = | 4.50 | 0.00 | 0.00 | 0.00 |
| **Weir Coeff.** | = | 3.33 | 0.00 | 0.00 | 0.00 |
| **Weir Type** | = | Riser | --- | --- | --- |
| **Multi-Stage** | = | Yes | No | No | No |

**Exfiltration =** 0.000 in/hr (Wet area) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2004 Version 7.4

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
       Rational Hydrology Study        Date: 02/14/13
----------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

----------------------------------------------------------------------
File: D12052POSTD.rd3

Program License Serial Number 4012

----------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      301.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  756.000(Ft.)
Highest elevation =  905.000(Ft.)
Lowest elevation =  780.000(Ft.)
Elevation difference =  125.000(Ft.) Slope = 16.534 %
Top of Initial Area Slope adjusted by User to 25.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  25.00 %, in a development type of
 Permanent Open Space
In Accordance With Table 3-2
Initial Area Time of Concentration =   6.90 minutes
 (for slope value of  10.00 %)
Rainfall intensity (I) =      7.492(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =     59.236(CFS)
Total initial stream area =       22.591(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =     78.088(CFS)
Depth of flow =   1.218(Ft.), Average velocity =   6.583(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              5.00
        2             40.00              0.00
        3             80.00              5.00
Manning's 'N' friction factor =   0.045
-----------------------------------------------------------------
Sub-Channel flow  =     78.088(CFS)
  '     '       flow top width =     19.484(Ft.)
```

```
  '     '    velocity=    6.583(Ft/s)
  '     '       area =     11.863(Sq.Ft)
  '     '       Froude number =     1.487

Upstream point elevation =   780.000(Ft.)
Downstream point elevation =   705.000(Ft.)
Flow length =   964.000(Ft.)
Travel time  =    2.44 min.
Time of concentration =    9.34 min.
Depth of flow =   1.218(Ft.)
Average velocity =   6.583(Ft/s)
Total irregular channel flow =    78.088(CFS)
Irregular channel normal depth above invert elev. =   1.218(Ft.)
Average velocity of channel(s) =   6.583(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      6.162(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =     15.715
Subarea runoff =     37.607(CFS) for     22.310(Ac.)
Total runoff =     96.843(CFS)        Total area =      44.901(Ac.)
Depth of flow =   1.320(Ft.), Average velocity =   6.947(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      145.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   702.000(Ft.)
Downstream point/station elevation =   699.200(Ft.)
Pipe length  =   276.50(Ft.)   Manning's N = 0.013
No. of pipes = 3  Required pipe flow  =    96.843(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    32.281(CFS)
Normal flow depth in pipe =   19.97(In.)
Flow top width inside pipe =   28.31(In.)
Critical Depth =   23.23(In.)
Pipe flow velocity =      9.30(Ft/s)
Travel time through pipe =    0.50 min.
Time of concentration (TC) =     9.84 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      145.000 to Point/Station      145.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     44.901(Ac.)
Runoff from this stream =     96.843(CFS)
Time of concentration =    9.84 min.
Rainfall intensity =     5.960(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      144.000 to Point/Station      144.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      6.312(In/Hr) for a   100.0 year storm
```

```
User specified values are as follows:
TC =   9.00 min.  Rain intensity =       6.31(In/Hr)
Total area =        1.100(Ac.)  Total runoff =     2.530(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      144.000 to Point/Station      145.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   710.000(Ft.)
Downstream point/station elevation =   699.200(Ft.)
Pipe length  =    66.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.530(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.530(CFS)
Normal flow depth in pipe =    3.83(In.)
Flow top width inside pipe =    8.90(In.)
Critical Depth =    8.33(In.)
Pipe flow velocity =     14.09(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =     9.08 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      145.000 to Point/Station      145.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.100(Ac.)
Runoff from this stream =      2.530(CFS)
Time of concentration =    9.08 min.
Rainfall intensity =     6.277(In/Hr)
Summary of stream data:

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


1       96.843      9.84               5.960
2        2.530      9.08               6.277
Qmax(1) =
          1.000 *    1.000 *    96.843) +
          0.950 *    1.000 *     2.530) + =      99.245
Qmax(2) =
          1.000 *    0.923 *    96.843) +
          1.000 *    1.000 *     2.530) + =      91.910

Total of 2 streams to confluence:
Flow rates before confluence point:
      96.843       2.530
Maximum flow rates at confluence using above data:
       99.245       91.910
Area of streams before confluence:
       44.901        1.100
Results of confluence:
Total flow rate =     99.245(CFS)
Time of concentration =     9.836 min.
Effective stream area after confluence =     46.001(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      145.000 to Point/Station       72.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   699.200(Ft.)
Downstream point/station elevation =   698.500(Ft.)
Pipe length  =    74.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    99.245(CFS)
Nearest computed pipe diameter  =     45.00(Ft.)
Calculated individual pipe flow  =    99.245(CFS)
Normal flow depth in pipe =   31.69(In.)
Flow top width inside pipe =   41.08(In.)
Critical Depth =   36.63(In.)
```

```
Pipe flow velocity =     11.94(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     9.94 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       72.000 to Point/Station       72.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     46.001(Ac.)
Runoff from this stream =     99.245(CFS)
Time of concentration =    9.94 min.
Rainfall intensity =     5.920(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       70.000 to Point/Station       72.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  254.000(Ft.)
Highest elevation =  714.000(Ft.)
Lowest elevation =  710.000(Ft.)
Elevation difference =    4.000(Ft.) Slope =  1.575 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 80.00 (Ft)
for the top area slope value of   1.58 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.92 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  80.000^.5)/(   1.575^(1/3)]=   6.92
Rainfall intensity (I) =      7.479(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      1.032(CFS)
Total initial stream area =        0.230(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       72.000 to Point/Station       72.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.230(Ac.)
Runoff from this stream =      1.032(CFS)
Time of concentration =    6.92 min.
Rainfall intensity =     7.479(In/Hr)
Summary of stream data:

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


1       99.245      9.94               5.920
2        1.032      6.92               7.479
Qmax(1) =
          1.000 *    1.000 *    99.245) +
          0.792 *    1.000 *     1.032) + =     100.062
Qmax(2) =
          1.000 *    0.696 *    99.245) +
          1.000 *    1.000 *     1.032) + =      70.116

Total of 2 streams to confluence:
Flow rates before confluence point:
      99.245       1.032
```

```
Maximum flow rates at confluence using above data:
      100.062       70.116
Area of streams before confluence:
       46.001        0.230
Results of confluence:
Total flow rate =    100.062(CFS)
Time of concentration =     9.939 min.
Effective stream area after confluence =     46.231(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       72.000 to Point/Station       73.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   698.500(Ft.)
Downstream point/station elevation =   698.000(Ft.)
Pipe length  =    53.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   100.062(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =   100.062(CFS)
Normal flow depth in pipe =   31.92(In.)
Flow top width inside pipe =   40.86(In.)
Critical Depth =   36.77(In.)
Pipe flow velocity =     11.94(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    10.01 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       73.000 to Point/Station       73.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     46.231(Ac.)
Runoff from this stream =    100.062(CFS)
Time of concentration =   10.01 min.
Rainfall intensity =     5.892(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       70.000 to Point/Station       71.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  278.000(Ft.)
Highest elevation =  714.000(Ft.)
Lowest elevation =  708.000(Ft.)
Elevation difference =    6.000(Ft.) Slope =  2.158 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 80.00 (Ft)
for the top area slope value of   2.16 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.23 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  80.000^.5)/(   2.158^(1/3)]=   6.23
Rainfall intensity (I) =      8.003(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      1.200(CFS)
Total initial stream area =        0.250(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       71.000 to Point/Station       73.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
```

```
Upstream point/station elevation =   703.500(Ft.)
Downstream point/station elevation =   698.000(Ft.)
Pipe length  =    37.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.200(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.200(CFS)
Normal flow depth in pipe =    3.19(In.)
Flow top width inside pipe =    5.99(In.)
Critical depth could not be calculated.
Pipe flow velocity =     11.30(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =     6.28 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       73.000 to Point/Station       73.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.250(Ac.)
Runoff from this stream =      1.200(CFS)
Time of concentration =    6.28 min.
Rainfall intensity =     7.958(In/Hr)
Summary of stream data:

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


1      100.062     10.01               5.892
2        1.200      6.28               7.958
Qmax(1) =
          1.000 *    1.000 *   100.062) +
          0.740 *    1.000 *     1.200) + =     100.951
Qmax(2) =
          1.000 *    0.628 *   100.062) +
          1.000 *    1.000 *     1.200) + =      63.994

Total of 2 streams to confluence:
Flow rates before confluence point:
     100.062       1.200
Maximum flow rates at confluence using above data:
      100.951       63.994
Area of streams before confluence:
       46.231        0.250
Results of confluence:
Total flow rate =    100.951(CFS)
Time of concentration =    10.013 min.
Effective stream area after confluence =     46.481(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       73.000 to Point/Station       74.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   698.000(Ft.)
Downstream point/station elevation =   696.000(Ft.)
Pipe length  =   197.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   100.951(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =   100.951(CFS)
Normal flow depth in pipe =   34.27(In.)
Flow top width inside pipe =   32.56(In.)
Critical Depth =   36.95(In.)
Pipe flow velocity =     12.01(Ft/s)
Travel time through pipe =    0.27 min.
Time of concentration (TC) =    10.29 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       74.000 to Point/Station       74.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
```

```
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     46.481(Ac.)
Runoff from this stream =    100.951(CFS)
Time of concentration =   10.29 min.
Rainfall intensity =     5.791(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      304.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =   84.000(Ft.)
Highest elevation =  772.000(Ft.)
Lowest elevation =  755.000(Ft.)
Elevation difference =   17.000(Ft.) Slope = 20.238 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  20.24 %, in a development type of
 Permanent Open Space
In Accordance With Table 3-2
Initial Area Time of Concentration =   6.90 minutes
 (for slope value of  10.00 %)
Rainfall intensity (I) =      7.492(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      1.030(CFS)
Total initial stream area =        0.393(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      304.000 to Point/Station      305.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      4.261(CFS)
Depth of flow =   0.191(Ft.), Average velocity =   2.345(Ft/s)
       ******* Irregular Channel Data ***********
-------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              2.00
       2            100.00              0.00
       3            200.00              2.00
Manning's 'N' friction factor =   0.045
-------------------------------------------------------------------
Sub-Channel flow  =      4.261(CFS)
  '     '       flow top width =     19.062(Ft.)
  '     '    velocity=    2.345(Ft/s)
  '     '       area =      1.817(Sq.Ft)
  '     '       Froude number =     1.339

Upstream point elevation =   755.000(Ft.)
Downstream point elevation =   704.000(Ft.)
Flow length =   440.000(Ft.)
Travel time  =    3.13 min.
Time of concentration =   10.03 min.
Depth of flow =   0.191(Ft.)
Average velocity =   2.345(Ft/s)
Total irregular channel flow =     4.261(CFS)
Irregular channel normal depth above invert elev. =   0.191(Ft.)
Average velocity of channel(s) =   2.345(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
```

```
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      5.887(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      1.260
Subarea runoff =      6.387(CFS) for      3.207(Ac.)
Total runoff =      7.418(CFS)        Total area =       3.600(Ac.)
Depth of flow =   0.235(Ft.), Average velocity =   2.694(Ft/s)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Process from Point/Station      305.000 to Point/Station       74.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   701.000(Ft.)
Downstream point/station elevation =   696.000(Ft.)
Pipe length  =   114.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.418(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     7.418(CFS)
Normal flow depth in pipe =    9.77(In.)
Flow top width inside pipe =    9.33(In.)
Critical depth could not be calculated.
Pipe flow velocity =     10.83(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =    10.20 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       74.000 to Point/Station       74.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.600(Ac.)
Runoff from this stream =      7.418(CFS)
Time of concentration =   10.20 min.
Rainfall intensity =     5.822(In/Hr)
Summary of stream data:

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


1      100.951     10.29               5.791
2        7.418     10.20               5.822
Qmax(1) =
          1.000 *    1.000 *   100.951) +
          0.995 *    1.000 *     7.418) + =     108.329
Qmax(2) =
          1.000 *    0.992 *   100.951) +
          1.000 *    1.000 *     7.418) + =     107.538

Total of 2 streams to confluence:
Flow rates before confluence point:
     100.951       7.418
Maximum flow rates at confluence using above data:
      108.329      107.538
Area of streams before confluence:
       46.481        3.600
Results of confluence:
Total flow rate =    108.329(CFS)
Time of concentration =    10.287 min.
Effective stream area after confluence =     50.081(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       74.000 to Point/Station       75.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   696.000(Ft.)
Downstream point/station elevation =   695.500(Ft.)
Pipe length  =    50.00(Ft.)   Manning's N = 0.013
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```
No. of pipes = 1  Required pipe flow  =   108.329(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =   108.329(CFS)
Normal flow depth in pipe =   33.23(In.)
Flow top width inside pipe =   39.55(In.)
Critical Depth =   38.04(In.)
Pipe flow velocity =     12.38(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    10.35 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       75.000 to Point/Station       75.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     50.081(Ac.)
Runoff from this stream =    108.329(CFS)
Time of concentration =   10.35 min.
Rainfall intensity =     5.766(In/Hr)


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Process from Point/Station       72.000 to Point/Station       75.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  300.000(Ft.)
Highest elevation =  710.000(Ft.)
Lowest elevation =  701.500(Ft.)
Elevation difference =    8.500(Ft.) Slope =  2.833 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   2.83 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.03 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  90.000^.5)/(   2.833^(1/3)]=   6.03
Rainfall intensity (I) =      8.169(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      1.103(CFS)
Total initial stream area =        0.225(Ac.)


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Process from Point/Station       75.000 to Point/Station       75.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.225(Ac.)
Runoff from this stream =      1.103(CFS)
Time of concentration =    6.03 min.
Rainfall intensity =     8.169(In/Hr)
Summary of stream data:

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


1      108.329     10.35               5.766
2        1.103      6.03               8.169
Qmax(1) =
          1.000 *    1.000 *   108.329) +
          0.706 *    1.000 *     1.103) + =     109.108
Qmax(2) =
```

```
          1.000 *    0.583 *   108.329) +
          1.000 *    1.000 *     1.103) + =      64.235

Total of 2 streams to confluence:
Flow rates before confluence point:
     108.329       1.103
Maximum flow rates at confluence using above data:
      109.108       64.235
Area of streams before confluence:
       50.081        0.225
Results of confluence:
Total flow rate =    109.108(CFS)
Time of concentration =    10.354 min.
Effective stream area after confluence =     50.306(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       75.000 to Point/Station       77.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   695.500(Ft.)
Downstream point/station elevation =   693.500(Ft.)
Pipe length  =   106.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   109.108(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =   109.108(CFS)
Normal flow depth in pipe =   30.70(In.)
Flow top width inside pipe =   31.92(In.)
Critical Depth =   36.94(In.)
Pipe flow velocity =     15.57(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    10.47 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 =     50.306(Ac.)
Runoff from this stream =    109.108(CFS)
Time of concentration =   10.47 min.
Rainfall intensity =     5.726(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       71.000 to Point/Station       76.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  339.000(Ft.)
Highest elevation =  708.000(Ft.)
Lowest elevation =  698.500(Ft.)
Elevation difference =    9.500(Ft.) Slope =  2.802 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   2.80 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.06 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  90.000^.5)/(   2.802^(1/3)]=   6.06
Rainfall intensity (I) =      8.149(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      1.335(CFS)
Total initial stream area =        0.273(Ac.)
```

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Process from Point/Station       76.000 to Point/Station       77.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   694.000(Ft.)
Downstream point/station elevation =   693.500(Ft.)
Pipe length  =    37.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.335(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.335(CFS)
Normal flow depth in pipe =    5.52(In.)
Flow top width inside pipe =    8.77(In.)
Critical Depth =    6.39(In.)
Pipe flow velocity =      4.70(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =     6.19 min.


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Process from Point/Station       77.000 to Point/Station       77.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.273(Ac.)
Runoff from this stream =      1.335(CFS)
Time of concentration =    6.19 min.
Rainfall intensity =     8.037(In/Hr)
Summary of stream data:

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


1      109.108     10.47               5.726
2        1.335      6.19               8.037
Qmax(1) =
          1.000 *    1.000 *   109.108) +
          0.712 *    1.000 *     1.335) + =     110.059
Qmax(2) =
          1.000 *    0.591 *   109.108) +
          1.000 *    1.000 *     1.335) + =      65.830

Total of 2 streams to confluence:
Flow rates before confluence point:
     109.108       1.335
Maximum flow rates at confluence using above data:
      110.059       65.830
Area of streams before confluence:
       50.306        0.273
Results of confluence:
Total flow rate =    110.059(CFS)
Time of concentration =    10.467 min.
Effective stream area after confluence =     50.579(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       77.000 to Point/Station       80.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   693.500(Ft.)
Downstream point/station elevation =   686.500(Ft.)
Pipe length  =   185.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   110.059(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =   110.059(CFS)
Normal flow depth in pipe =   25.45(In.)
Flow top width inside pipe =   32.77(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.60(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =    10.62 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 =     50.579(Ac.)
Runoff from this stream =    110.059(CFS)
Time of concentration =   10.62 min.
Rainfall intensity =     5.674(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       76.000 to Point/Station       78.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  181.000(Ft.)
Highest elevation =  698.500(Ft.)
Lowest elevation =  693.000(Ft.)
Elevation difference =    5.500(Ft.) Slope =  3.039 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   3.04 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.89 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  90.000^.5)/(   3.039^(1/3)]=   5.89
Rainfall intensity (I) =      8.293(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.776(CFS)
Total initial stream area =        0.156(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       78.000 to Point/Station       79.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   688.500(Ft.)
Downstream point/station elevation =   688.000(Ft.)
Pipe length  =    37.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.776(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.776(CFS)
Normal flow depth in pipe =    3.98(In.)
Flow top width inside pipe =    8.94(In.)
Critical Depth =    4.82(In.)
Pipe flow velocity =      4.12(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =     6.04 min.


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Process from Point/Station       79.000 to Point/Station       79.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
```

```
Time of concentration =     6.04 min.
Rainfall intensity =      8.160(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.226
Subarea runoff =      1.070(CFS) for      0.221(Ac.)
Total runoff =      1.846(CFS)        Total area =       0.377(Ac.)


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Process from Point/Station       79.000 to Point/Station       80.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   688.000(Ft.)
Downstream point/station elevation =   686.500(Ft.)
Pipe length  =   150.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.846(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     1.846(CFS)
Normal flow depth in pipe =    6.13(In.)
Flow top width inside pipe =   12.00(In.)
Critical Depth =    6.95(In.)
Pipe flow velocity =      4.58(Ft/s)
Travel time through pipe =    0.55 min.
Time of concentration (TC) =     6.59 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 2
Stream flow area =      0.377(Ac.)
Runoff from this stream =      1.846(CFS)
Time of concentration =    6.59 min.
Rainfall intensity =     7.717(In/Hr)
Summary of stream data:

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


1      110.059     10.62               5.674
2        1.846      6.59               7.717
Qmax(1) =
          1.000 *    1.000 *   110.059) +
          0.735 *    1.000 *     1.846) + =     111.416
Qmax(2) =
          1.000 *    0.621 *   110.059) +
          1.000 *    1.000 *     1.846) + =      70.163

Total of 2 streams to confluence:
Flow rates before confluence point:
     110.059       1.846
Maximum flow rates at confluence using above data:
      111.416       70.163
Area of streams before confluence:
       50.579        0.377
Results of confluence:
Total flow rate =    111.416(CFS)
Time of concentration =    10.617 min.
Effective stream area after confluence =     50.956(Ac.)
End of computations, total study area =          50.956 (Ac.)
```

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2004 Version 7.4

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
       Rational Hydrology Study        Date: 02/15/13
----------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

----------------------------------------------------------------------
File: PADPONDD.rd3

Program License Serial Number 4012

----------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       83.000 to Point/Station       84.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   72.000(Ft.)
Highest elevation =  748.000(Ft.)
Lowest elevation =  747.280(Ft.)
Elevation difference =    0.720(Ft.) Slope =  1.000 %
Top of Initial Area Slope adjusted by User to  0.500 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 50.00 (Ft)
for the top area slope value of   0.50 %, in a development type of
 10.9 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =   8.70 minutes
 (for slope value of   0.50 %)
Rainfall intensity (I) =      6.451(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.453(CFS)
Total initial stream area =        0.117(Ac.)


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Process from Point/Station       84.000 to Point/Station       85.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   745.280(Ft.)
Downstream point/station elevation =   730.000(Ft.)
Pipe length  =   203.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.453(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.453(CFS)
Normal flow depth in pipe =    2.23(In.)
Flow top width inside pipe =    5.80(In.)
Critical Depth =    4.12(In.)
Pipe flow velocity =      6.82(Ft/s)
Travel time through pipe =    0.50 min.
```

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Time of concentration (TC) =     9.20 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       85.000 to Point/Station       85.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     9.20 min.
Rainfall intensity =      6.225(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.349
Subarea runoff =      1.717(CFS) for      0.464(Ac.)
Total runoff =      2.170(CFS)        Total area =       0.581(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       85.000 to Point/Station       86.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   730.000(Ft.)
Downstream point/station elevation =   715.000(Ft.)
Pipe length  =   154.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.170(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.170(CFS)
Normal flow depth in pipe =    4.07(In.)
Flow top width inside pipe =    8.96(In.)
Critical Depth =    7.95(In.)
Pipe flow velocity =     11.18(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =     9.43 min.


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Process from Point/Station       86.000 to Point/Station       86.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     9.43 min.
Rainfall intensity =      6.126(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.547
Subarea runoff =      1.182(CFS) for      0.331(Ac.)
Total runoff =      3.352(CFS)        Total area =       0.912(Ac.)


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Process from Point/Station       86.000 to Point/Station       87.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   715.000(Ft.)
Downstream point/station elevation =   700.000(Ft.)
Pipe length  =   167.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.352(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     3.352(CFS)
Normal flow depth in pipe =    5.43(In.)
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Flow top width inside pipe =    8.81(In.)
Critical depth could not be calculated.
Pipe flow velocity =     12.05(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =     9.66 min.


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Process from Point/Station       87.000 to Point/Station       87.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     9.66 min.
Rainfall intensity =      6.032(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.813
Subarea runoff =      1.551(CFS) for      0.443(Ac.)
Total runoff =      4.904(CFS)        Total area =       1.355(Ac.)


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Process from Point/Station       87.000 to Point/Station       88.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   700.000(Ft.)
Downstream point/station elevation =   688.000(Ft.)
Pipe length  =   109.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.904(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     4.904(CFS)
Normal flow depth in pipe =    6.63(In.)
Flow top width inside pipe =    7.92(In.)
Critical depth could not be calculated.
Pipe flow velocity =     14.05(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =     9.79 min.


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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 =      1.355(Ac.)
Runoff from this stream =      4.904(CFS)
Time of concentration =    9.79 min.
Rainfall intensity =     5.980(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       96.000 to Point/Station       97.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  750.000(Ft.)
Lowest elevation =  749.000(Ft.)
Elevation difference =    1.000(Ft.) Slope =  1.000 %
```

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INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 65.00 (Ft)
for the top area slope value of   1.00 %, in a development type of
 10.9 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =   7.90 minutes
 (for slope value of   1.00 %)
Rainfall intensity (I) =      6.865(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.770(CFS)
Total initial stream area =        0.187(Ac.)


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Process from Point/Station       97.000 to Point/Station       98.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   747.000(Ft.)
Downstream point/station elevation =   744.000(Ft.)
Pipe length  =    81.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.770(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.770(CFS)
Normal flow depth in pipe =    3.74(In.)
Flow top width inside pipe =    5.81(In.)
Critical Depth =    5.25(In.)
Pipe flow velocity =      5.97(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =     8.13 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       98.000 to Point/Station       98.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.13 min.
Rainfall intensity =      6.742(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.286
Subarea runoff =      1.159(CFS) for      0.290(Ac.)
Total runoff =      1.929(CFS)        Total area =       0.477(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       98.000 to Point/Station       99.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   744.000(Ft.)
Downstream point/station elevation =   732.000(Ft.)
Pipe length  =   145.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.929(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.929(CFS)
Normal flow depth in pipe =    3.99(In.)
Flow top width inside pipe =    8.94(In.)
Critical Depth =    7.60(In.)
Pipe flow velocity =     10.21(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =     8.36 min.


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Process from Point/Station       99.000 to Point/Station       99.000
**** SUBAREA FLOW ADDITION ****
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Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.36 min.
Rainfall intensity =      6.618(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.489
Subarea runoff =      1.307(CFS) for      0.338(Ac.)
Total runoff =      3.236(CFS)        Total area =       0.815(Ac.)


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Process from Point/Station       99.000 to Point/Station      100.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   732.000(Ft.)
Downstream point/station elevation =   717.000(Ft.)
Pipe length  =   150.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.236(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     3.236(CFS)
Normal flow depth in pipe =    5.12(In.)
Flow top width inside pipe =    8.91(In.)
Critical depth could not be calculated.
Pipe flow velocity =     12.46(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =     8.56 min.


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Process from Point/Station      100.000 to Point/Station      100.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.56 min.
Rainfall intensity =      6.518(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.694
Subarea runoff =      1.284(CFS) for      0.341(Ac.)
Total runoff =      4.521(CFS)        Total area =       1.156(Ac.)


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Process from Point/Station      100.000 to Point/Station      101.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   717.000(Ft.)
Downstream point/station elevation =   704.000(Ft.)
Pipe length  =   150.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.521(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     4.521(CFS)
Normal flow depth in pipe =    6.86(In.)
Flow top width inside pipe =    7.67(In.)
Critical depth could not be calculated.
Pipe flow velocity =     12.52(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =     8.76 min.
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Process from Point/Station      101.000 to Point/Station      101.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.76 min.
Rainfall intensity =      6.421(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.898
Subarea runoff =      1.243(CFS) for      0.340(Ac.)
Total runoff =      5.764(CFS)        Total area =       1.496(Ac.)


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Process from Point/Station      101.000 to Point/Station      102.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   704.000(Ft.)
Downstream point/station elevation =   694.000(Ft.)
Pipe length  =   120.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.764(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     5.764(CFS)
Normal flow depth in pipe =    6.42(In.)
Flow top width inside pipe =   11.97(In.)
Critical Depth =   11.38(In.)
Pipe flow velocity =     13.47(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =     8.91 min.


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Process from Point/Station      102.000 to Point/Station      102.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.91 min.
Rainfall intensity =      6.352(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      1.111
Subarea runoff =      1.295(CFS) for      0.356(Ac.)
Total runoff =      7.059(CFS)        Total area =       1.852(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station       88.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   690.000(Ft.)
Downstream point/station elevation =   688.000(Ft.)
Pipe length  =    64.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.059(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     7.059(CFS)
Normal flow depth in pipe =    8.53(In.)
Flow top width inside pipe =   14.86(In.)
Critical Depth =   12.76(In.)
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Pipe flow velocity =      9.79(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =     9.02 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 2
Stream flow area =      1.852(Ac.)
Runoff from this stream =      7.059(CFS)
Time of concentration =    9.02 min.
Rainfall intensity =     6.303(In/Hr)
Summary of stream data:

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


1        4.904      9.79               5.980
2        7.059      9.02               6.303
Qmax(1) =
          1.000 *    1.000 *     4.904) +
          0.949 *    1.000 *     7.059) + =      11.601
Qmax(2) =
          1.000 *    0.922 *     4.904) +
          1.000 *    1.000 *     7.059) + =      11.579

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.904       7.059
Maximum flow rates at confluence using above data:
       11.601       11.579
Area of streams before confluence:
        1.355        1.852
Results of confluence:
Total flow rate =     11.601(CFS)
Time of concentration =     9.786 min.
Effective stream area after confluence =      3.207(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       88.000 to Point/Station       89.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   688.000(Ft.)
Downstream point/station elevation =   687.000(Ft.)
Pipe length  =    43.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.601(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    11.601(CFS)
Normal flow depth in pipe =   11.36(In.)
Flow top width inside pipe =   17.37(In.)
Critical Depth =   15.57(In.)
Pipe flow velocity =      9.88(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =     9.86 min.


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Process from Point/Station       89.000 to Point/Station       89.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
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```
Time of concentration =     9.86 min.
Rainfall intensity =      5.952(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      2.159
Subarea runoff =      1.247(CFS) for      0.391(Ac.)
Total runoff =     12.848(CFS)        Total area =       3.598(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       89.000 to Point/Station       90.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   687.000(Ft.)
Downstream point/station elevation =   680.000(Ft.)
Pipe length  =   138.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.848(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    12.848(CFS)
Normal flow depth in pipe =   10.95(In.)
Flow top width inside pipe =   13.32(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.38(Ft/s)
Travel time through pipe =    0.17 min.
Time of concentration (TC) =    10.03 min.


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Process from Point/Station       90.000 to Point/Station       90.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =    10.03 min.
Rainfall intensity =      5.886(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      2.372
Subarea runoff =      1.115(CFS) for      0.356(Ac.)
Total runoff =     13.963(CFS)        Total area =       3.954(Ac.)


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Process from Point/Station       90.000 to Point/Station       91.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   680.000(Ft.)
Downstream point/station elevation =   676.000(Ft.)
Pipe length  =   167.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.963(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    13.963(CFS)
Normal flow depth in pipe =   12.84(In.)
Flow top width inside pipe =   16.28(In.)
Critical Depth =   16.55(In.)
Pipe flow velocity =     10.34(Ft/s)
Travel time through pipe =    0.27 min.
Time of concentration (TC) =    10.30 min.


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Process from Point/Station       91.000 to Point/Station       91.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
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[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =    10.30 min.
Rainfall intensity =      5.786(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      2.674
Subarea runoff =      1.506(CFS) for      0.502(Ac.)
Total runoff =     15.469(CFS)        Total area =       4.456(Ac.)


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Process from Point/Station       91.000 to Point/Station       92.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   676.000(Ft.)
Downstream point/station elevation =   667.000(Ft.)
Pipe length  =   133.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    15.469(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    15.469(CFS)
Normal flow depth in pipe =   11.34(In.)
Flow top width inside pipe =   12.88(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.54(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =    10.44 min.


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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 =      4.456(Ac.)
Runoff from this stream =     15.469(CFS)
Time of concentration =   10.44 min.
Rainfall intensity =     5.735(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   72.000(Ft.)
Highest elevation =  686.000(Ft.)
Lowest elevation =  685.000(Ft.)
Elevation difference =    1.000(Ft.) Slope =  1.389 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 65.00 (Ft)
for the top area slope value of   1.38 %, in a development type of
 10.9 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =   7.90 minutes
 (for slope value of   1.00 %)
Rainfall intensity (I) =      6.865(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.437(CFS)
Total initial stream area =        0.106(Ac.)


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Process from Point/Station      104.000 to Point/Station      105.000
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**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_______________________________________________________________________
Upstream point/station elevation =   684.000(Ft.)
Downstream point/station elevation =   672.000(Ft.)
Pipe length  =   285.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.437(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.437(CFS)
Normal flow depth in pipe =    2.56(In.)
Flow top width inside pipe =    5.93(In.)
Critical Depth =    4.04(In.)
Pipe flow velocity =      5.46(Ft/s)
Travel time through pipe =    0.87 min.
Time of concentration (TC) =     8.77 min.


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Process from Point/Station      105.000 to Point/Station      105.000
**** SUBAREA FLOW ADDITION ****
_______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     8.77 min.
Rainfall intensity =      6.418(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.473
Subarea runoff =      2.598(CFS) for      0.682(Ac.)
Total runoff =      3.034(CFS)        Total area =       0.788(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station       92.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_______________________________________________________________________
Upstream point/station elevation =   672.000(Ft.)
Downstream point/station elevation =   667.000(Ft.)
Pipe length  =    86.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.034(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     3.034(CFS)
Normal flow depth in pipe =    5.87(In.)
Flow top width inside pipe =    8.57(In.)
Critical depth could not be calculated.
Pipe flow velocity =      9.94(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     8.91 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       92.000 to Point/Station       92.000
**** CONFLUENCE OF MINOR STREAMS ****
_______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.788(Ac.)
Runoff from this stream =      3.034(CFS)
Time of concentration =    8.91 min.
Rainfall intensity =     6.351(In/Hr)
Summary of stream data:

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


1       15.469     10.44               5.735
2        3.034      8.91               6.351
Qmax(1) =
```

```
          1.000 *    1.000 *    15.469) +
          0.903 *    1.000 *     3.034) + =      18.209
Qmax(2) =
          1.000 *    0.854 *    15.469) +
          1.000 *    1.000 *     3.034) + =      16.241

Total of 2 streams to confluence:
Flow rates before confluence point:
      15.469       3.034
Maximum flow rates at confluence using above data:
       18.209       16.241
Area of streams before confluence:
        4.456        0.788
Results of confluence:
Total flow rate =     18.209(CFS)
Time of concentration =    10.442 min.
Effective stream area after confluence =      5.244(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       92.000 to Point/Station       93.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   667.000(Ft.)
Downstream point/station elevation =   665.000(Ft.)
Pipe length  =    77.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    18.209(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    18.209(CFS)
Normal flow depth in pipe =   13.10(In.)
Flow top width inside pipe =   20.35(In.)
Critical Depth =   18.62(In.)
Pipe flow velocity =     11.53(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    10.55 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       93.000 to Point/Station       93.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      5.244(Ac.)
Runoff from this stream =     18.209(CFS)
Time of concentration =   10.55 min.
Rainfall intensity =     5.696(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      107.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   84.000(Ft.)
Highest elevation =  710.500(Ft.)
Lowest elevation =  710.000(Ft.)
Elevation difference =    0.500(Ft.) Slope =  0.595 %
Top of Initial Area Slope adjusted by User to  0.562 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 50.00 (Ft)
for the top area slope value of   0.56 %, in a development type of
 10.9 DU/A or Less
In Accordance With Table 3-2
```

```
Initial Area Time of Concentration =   8.70 minutes
 (for slope value of   0.50 %)
Rainfall intensity (I) =      6.451(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.557(CFS)
Total initial stream area =        0.144(Ac.)


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Process from Point/Station      107.000 to Point/Station      109.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   707.000(Ft.)
Downstream point/station elevation =   695.000(Ft.)
Pipe length  =   467.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.557(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.557(CFS)
Normal flow depth in pipe =    3.42(In.)
Flow top width inside pipe =    5.94(In.)
Critical Depth =    4.56(In.)
Pipe flow velocity =      4.83(Ft/s)
Travel time through pipe =    1.61 min.
Time of concentration (TC) =    10.31 min.


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Process from Point/Station      109.000 to Point/Station      109.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =    10.31 min.
Rainfall intensity =      5.781(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.759
Subarea runoff =      3.830(CFS) for      1.121(Ac.)
Total runoff =      4.388(CFS)        Total area =       1.265(Ac.)


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Process from Point/Station      109.000 to Point/Station      109.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.265(Ac.)
Runoff from this stream =      4.388(CFS)
Time of concentration =   10.31 min.
Rainfall intensity =     5.781(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      108.100
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   68.000(Ft.)
Highest elevation =  695.000(Ft.)
Lowest elevation =  694.500(Ft.)
```

```
Elevation difference =    0.500(Ft.) Slope =  0.735 %
Top of Initial Area Slope adjusted by User to  0.500 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 50.00 (Ft)
for the top area slope value of   0.50 %, in a development type of
 10.9 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =   8.70 minutes
 (for slope value of   0.50 %)
Rainfall intensity (I) =      6.451(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.824(CFS)
Total initial stream area =        0.213(Ac.)


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Process from Point/Station      108.100 to Point/Station      109.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   692.500(Ft.)
Downstream point/station elevation =   691.500(Ft.)
Pipe length  =    92.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.824(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.824(CFS)
Normal flow depth in pipe =    4.38(In.)
Flow top width inside pipe =    9.00(In.)
Critical Depth =    4.97(In.)
Pipe flow velocity =      3.86(Ft/s)
Travel time through pipe =    0.40 min.
Time of concentration (TC) =     9.10 min.


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Process from Point/Station      109.000 to Point/Station      109.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.213(Ac.)
Runoff from this stream =      0.824(CFS)
Time of concentration =    9.10 min.
Rainfall intensity =     6.268(In/Hr)
Summary of stream data:

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


1        4.388     10.31               5.781
2        0.824      9.10               6.268
Qmax(1) =
          1.000 *    1.000 *     4.388) +
          0.922 *    1.000 *     0.824) + =       5.148
Qmax(2) =
          1.000 *    0.882 *     4.388) +
          1.000 *    1.000 *     0.824) + =       4.695

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.388       0.824
Maximum flow rates at confluence using above data:
        5.148        4.695
Area of streams before confluence:
        1.265        0.213
Results of confluence:
Total flow rate =      5.148(CFS)
Time of concentration =    10.313 min.
Effective stream area after confluence =      1.478(Ac.)


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Process from Point/Station      109.000 to Point/Station      111.000
```

```
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =   691.500(Ft.)
Downstream point/station elevation =   690.500(Ft.)
Pipe length  =   103.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.148(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     5.148(CFS)
Normal flow depth in pipe =   10.23(In.)
Flow top width inside pipe =   13.97(In.)
Critical Depth =   11.04(In.)
Pipe flow velocity =      5.77(Ft/s)
Travel time through pipe =    0.30 min.
Time of concentration (TC) =    10.61 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      111.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.478(Ac.)
Runoff from this stream =      5.148(CFS)
Time of concentration =   10.61 min.
Rainfall intensity =     5.676(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      111.000
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   95.000(Ft.)
Highest elevation =  698.000(Ft.)
Lowest elevation =  697.000(Ft.)
Elevation difference =    1.000(Ft.) Slope =  1.053 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 65.00 (Ft)
for the top area slope value of   1.05 %, in a development type of
 10.9 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =   7.90 minutes
 (for slope value of   1.00 %)
Rainfall intensity (I) =      6.865(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.362(CFS)
Total initial stream area =        0.088(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      111.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.088(Ac.)
Runoff from this stream =      0.362(CFS)
Time of concentration =    7.90 min.
Rainfall intensity =     6.865(In/Hr)
Summary of stream data:

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


1        5.148     10.61               5.676
```

```
2        0.362      7.90               6.865
Qmax(1) =
          1.000 *    1.000 *     5.148) +
          0.827 *    1.000 *     0.362) + =       5.448
Qmax(2) =
          1.000 *    0.745 *     5.148) +
          1.000 *    1.000 *     0.362) + =       4.196

Total of 2 streams to confluence:
Flow rates before confluence point:
       5.148       0.362
Maximum flow rates at confluence using above data:
        5.448        4.196
Area of streams before confluence:
        1.478        0.088
Results of confluence:
Total flow rate =      5.448(CFS)
Time of concentration =    10.610 min.
Effective stream area after confluence =      1.566(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      112.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   690.500(Ft.)
Downstream point/station elevation =   689.000(Ft.)
Pipe length  =   129.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.448(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     5.448(CFS)
Normal flow depth in pipe =    9.98(In.)
Flow top width inside pipe =   14.15(In.)
Critical Depth =   11.36(In.)
Pipe flow velocity =      6.28(Ft/s)
Travel time through pipe =    0.34 min.
Time of concentration (TC) =    10.95 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      112.000 to Point/Station      112.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =    10.95 min.
Rainfall intensity =      5.561(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      1.129
Subarea runoff =      0.828(CFS) for      0.315(Ac.)
Total runoff =      6.276(CFS)        Total area =       1.881(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      112.000 to Point/Station      113.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   689.000(Ft.)
Downstream point/station elevation =   687.000(Ft.)
Pipe length  =   130.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.276(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     6.276(CFS)
Normal flow depth in pipe =   10.00(In.)
Flow top width inside pipe =   14.14(In.)
Critical Depth =   12.13(In.)
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Pipe flow velocity =      7.23(Ft/s)
Travel time through pipe =    0.30 min.
Time of concentration (TC) =    11.25 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      113.000 to Point/Station      113.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =    11.25 min.
Rainfall intensity =      5.465(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      1.311
Subarea runoff =      0.888(CFS) for      0.304(Ac.)
Total runoff =      7.165(CFS)        Total area =       2.185(Ac.)


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Process from Point/Station      113.000 to Point/Station      114.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   687.000(Ft.)
Downstream point/station elevation =   682.000(Ft.)
Pipe length  =   130.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.165(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     7.165(CFS)
Normal flow depth in pipe =    8.07(In.)
Flow top width inside pipe =   14.96(In.)
Critical Depth =   12.83(In.)
Pipe flow velocity =     10.64(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =    11.46 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      114.000 to Point/Station      114.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =    11.46 min.
Rainfall intensity =      5.402(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      1.487
Subarea runoff =      0.867(CFS) for      0.293(Ac.)
Total runoff =      8.032(CFS)        Total area =       2.478(Ac.)


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Process from Point/Station      114.000 to Point/Station      115.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   682.000(Ft.)
Downstream point/station elevation =   678.000(Ft.)
Pipe length  =   130.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.032(CFS)
Nearest computed pipe diameter  =     15.00(In.)
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```
Calculated individual pipe flow  =     8.032(CFS)
Normal flow depth in pipe =    9.33(In.)
Flow top width inside pipe =   14.55(In.)
Critical Depth =   13.39(In.)
Pipe flow velocity =     10.02(Ft/s)
Travel time through pipe =    0.22 min.
Time of concentration (TC) =    11.67 min.


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Process from Point/Station      115.000 to Point/Station      115.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =    11.67 min.
Rainfall intensity =      5.337(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      1.663
Subarea runoff =      0.842(CFS) for      0.293(Ac.)
Total runoff =      8.874(CFS)        Total area =       2.771(Ac.)


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Process from Point/Station      115.000 to Point/Station      116.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   678.000(Ft.)
Downstream point/station elevation =   674.000(Ft.)
Pipe length  =   103.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.874(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     8.874(CFS)
Normal flow depth in pipe =    9.22(In.)
Flow top width inside pipe =   14.60(In.)
Critical Depth =   13.82(In.)
Pipe flow velocity =     11.21(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =    11.83 min.


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Process from Point/Station      116.000 to Point/Station      116.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =    11.83 min.
Rainfall intensity =      5.293(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      1.940
Subarea runoff =      1.396(CFS) for      0.463(Ac.)
Total runoff =     10.270(CFS)        Total area =       3.234(Ac.)


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Process from Point/Station      116.000 to Point/Station      116.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
```

```
Stream flow area =      3.234(Ac.)
Runoff from this stream =     10.270(CFS)
Time of concentration =   11.83 min.
Rainfall intensity =     5.293(In/Hr)


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Process from Point/Station      117.000 to Point/Station      118.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  697.000(Ft.)
Lowest elevation =  694.000(Ft.)
Elevation difference =    3.000(Ft.) Slope =  3.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   3.00 %, in a development type of
 10.9 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =   6.40 minutes
 (for slope value of   3.00 %)
Rainfall intensity (I) =      7.864(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.708(CFS)
Total initial stream area =        0.150(Ac.)


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Process from Point/Station      118.000 to Point/Station      119.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   694.000(Ft.)
Downstream point/station elevation =   690.000(Ft.)
Pipe length  =   130.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.708(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.708(CFS)
Normal flow depth in pipe =    3.77(In.)
Flow top width inside pipe =    5.80(In.)
Critical Depth =    5.09(In.)
Pipe flow velocity =      5.45(Ft/s)
Travel time through pipe =    0.40 min.
Time of concentration (TC) =     6.80 min.


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Process from Point/Station      119.000 to Point/Station      119.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.80 min.
Rainfall intensity =      7.565(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.311
Subarea runoff =      1.643(CFS) for      0.368(Ac.)
Total runoff =      2.351(CFS)        Total area =       0.518(Ac.)
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```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      119.000 to Point/Station      120.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   690.000(Ft.)
Downstream point/station elevation =   685.000(Ft.)
Pipe length  =   128.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.351(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.351(CFS)
Normal flow depth in pipe =    5.65(In.)
Flow top width inside pipe =    8.70(In.)
Critical Depth =    8.16(In.)
Pipe flow velocity =      8.05(Ft/s)
Travel time through pipe =    0.26 min.
Time of concentration (TC) =     7.06 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      120.000 to Point/Station      120.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     7.06 min.
Rainfall intensity =      7.380(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.530
Subarea runoff =      1.559(CFS) for      0.365(Ac.)
Total runoff =      3.910(CFS)        Total area =       0.883(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      120.000 to Point/Station      121.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   685.000(Ft.)
Downstream point/station elevation =   680.000(Ft.)
Pipe length  =   174.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.910(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     3.910(CFS)
Normal flow depth in pipe =    7.03(In.)
Flow top width inside pipe =   11.82(In.)
Critical Depth =   10.08(In.)
Pipe flow velocity =      8.18(Ft/s)
Travel time through pipe =    0.35 min.
Time of concentration (TC) =     7.42 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      121.000 to Point/Station      121.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     7.42 min.
Rainfall intensity =      7.151(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
```

```
(Q=KCIA) is C = 0.600  CA =      0.826
Subarea runoff =      1.994(CFS) for      0.493(Ac.)
Total runoff =      5.904(CFS)        Total area =       1.376(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      121.000 to Point/Station      122.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   680.000(Ft.)
Downstream point/station elevation =   675.000(Ft.)
Pipe length  =   182.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.904(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     5.904(CFS)
Normal flow depth in pipe =    9.84(In.)
Flow top width inside pipe =    9.22(In.)
Critical depth could not be calculated.
Pipe flow velocity =      8.57(Ft/s)
Travel time through pipe =    0.35 min.
Time of concentration (TC) =     7.77 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      122.000 to Point/Station      122.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     7.77 min.
Rainfall intensity =      6.939(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      1.141
Subarea runoff =      2.015(CFS) for      0.526(Ac.)
Total runoff =      7.919(CFS)        Total area =       1.902(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      122.000 to Point/Station      116.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   675.000(Ft.)
Downstream point/station elevation =   674.000(Ft.)
Pipe length  =    81.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.919(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     7.919(CFS)
Normal flow depth in pipe =   10.88(In.)
Flow top width inside pipe =   17.61(In.)
Critical Depth =   13.09(In.)
Pipe flow velocity =      7.10(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =     7.96 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      116.000 to Point/Station      116.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.902(Ac.)
Runoff from this stream =      7.919(CFS)
Time of concentration =    7.96 min.
Rainfall intensity =     6.832(In/Hr)
Summary of stream data:
```

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


1       10.270     11.83               5.293
2        7.919      7.96               6.832
Qmax(1) =
          1.000 *    1.000 *    10.270) +
          0.775 *    1.000 *     7.919) + =      16.405
Qmax(2) =
          1.000 *    0.673 *    10.270) +
          1.000 *    1.000 *     7.919) + =      14.832

Total of 2 streams to confluence:
Flow rates before confluence point:
      10.270       7.919
Maximum flow rates at confluence using above data:
       16.405       14.832
Area of streams before confluence:
        3.234        1.902
Results of confluence:
Total flow rate =     16.405(CFS)
Time of concentration =    11.825 min.
Effective stream area after confluence =      5.136(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      116.000 to Point/Station       93.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   674.000(Ft.)
Downstream point/station elevation =   665.000(Ft.)
Pipe length  =   186.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.405(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    16.405(CFS)
Normal flow depth in pipe =   11.20(In.)
Flow top width inside pipe =   17.45(In.)
Critical depth could not be calculated.
Pipe flow velocity =     14.19(Ft/s)
Travel time through pipe =    0.22 min.
Time of concentration (TC) =    12.04 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       93.000 to Point/Station       93.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      5.136(Ac.)
Runoff from this stream =     16.405(CFS)
Time of concentration =   12.04 min.
Rainfall intensity =     5.231(In/Hr)
Summary of stream data:

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


1       18.209     10.55               5.696
2       16.405     12.04               5.231
Qmax(1) =
          1.000 *    1.000 *    18.209) +
          1.000 *    0.876 *    16.405) + =      32.584
Qmax(2) =
          0.918 *    1.000 *    18.209) +
          1.000 *    1.000 *    16.405) + =      33.127

Total of 2 main streams to confluence:
Flow rates before confluence point:
      18.209      16.405
```

```
Maximum flow rates at confluence using above data:
       32.584       33.127
Area of streams before confluence:
        5.244        5.136


Results of confluence:
Total flow rate =     33.127(CFS)
Time of concentration =    12.044 min.
Effective stream area after confluence  =     10.380(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       93.000 to Point/Station       93.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =    12.04 min.
Rainfall intensity =      5.231(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      6.599
Subarea runoff =      1.388(CFS) for      0.618(Ac.)
Total runoff =     34.516(CFS)        Total area =      10.998(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       93.000 to Point/Station       94.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   665.000(Ft.)
Downstream point/station elevation =   662.000(Ft.)
Pipe length  =    20.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    34.516(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    34.516(CFS)
Normal flow depth in pipe =   12.73(In.)
Flow top width inside pipe =   16.38(In.)
Critical depth could not be calculated.
Pipe flow velocity =     25.83(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =    12.06 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 =     10.998(Ac.)
Runoff from this stream =     34.516(CFS)
Time of concentration =   12.06 min.
Rainfall intensity =     5.227(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      117.000 to Point/Station      118.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
```

```
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  703.000(Ft.)
Lowest elevation =  694.000(Ft.)
Elevation difference =    9.000(Ft.) Slope =  9.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   9.00 %, in a development type of
 Permanent Open Space
In Accordance With Table 3-2
Initial Area Time of Concentration =   6.90 minutes
 (for slope value of  10.00 %)
Rainfall intensity (I) =      7.492(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      0.134(CFS)
Total initial stream area =        0.051(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      118.000 to Point/Station       94.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.011(CFS)
Depth of flow =   0.435(Ft.), Average velocity =   7.089(Ft/s)
        ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              1.00
       2              2.00              0.00
       3              4.00              2.00
Manning's 'N' friction factor =   0.014
----------------------------------------------------------------
Sub-Channel flow  =      2.011(CFS)
  '     '       flow top width =      1.305(Ft.)
  '     '    velocity=    7.089(Ft/s)
  '     '       area =      0.284(Sq.Ft)
  '     '       Froude number =     2.679

Upstream point elevation =   694.000(Ft.)
Downstream point elevation =   662.000(Ft.)
Flow length =   722.000(Ft.)
Travel time  =    1.70 min.
Time of concentration =    8.60 min.
Depth of flow =   0.435(Ft.)
Average velocity =   7.089(Ft/s)
Total irregular channel flow =     2.011(CFS)
Irregular channel normal depth above invert elev. =   0.435(Ft.)
Average velocity of channel(s) =   7.089(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity =      6.501(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      0.586
Subarea runoff =      3.677(CFS) for      1.624(Ac.)
Total runoff =      3.811(CFS)       Total area =       1.675(Ac.)
Depth of flow =   0.553(Ft.), Average velocity =   8.318(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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 =      1.675(Ac.)
```

```
Runoff from this stream =      3.811(CFS)
Time of concentration =    8.60 min.
Rainfall intensity =     6.501(In/Hr)
Summary of stream data:

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


1       34.516     12.06               5.227
2        3.811      8.60               6.501
Qmax(1) =
          1.000 *    1.000 *    34.516) +
          0.804 *    1.000 *     3.811) + =      37.580
Qmax(2) =
          1.000 *    0.713 *    34.516) +
          1.000 *    1.000 *     3.811) + =      28.423

Total of 2 streams to confluence:
Flow rates before confluence point:
      34.516       3.811
Maximum flow rates at confluence using above data:
       37.580       28.423
Area of streams before confluence:
       10.998        1.675
Results of confluence:
Total flow rate =     37.580(CFS)
Time of concentration =    12.057 min.
Effective stream area after confluence =     12.673(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       94.000 to Point/Station       81.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   656.500(Ft.)
Downstream point/station elevation =   655.700(Ft.)
Pipe length  =    73.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    37.580(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    37.580(CFS)
Normal flow depth in pipe =   21.75(In.)
Flow top width inside pipe =   26.79(In.)
Critical Depth =   24.87(In.)
Pipe flow velocity =      9.86(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =    12.18 min.
End of computations, total study area =          12.673 (Ac.)
```

# Hydrograph Plot

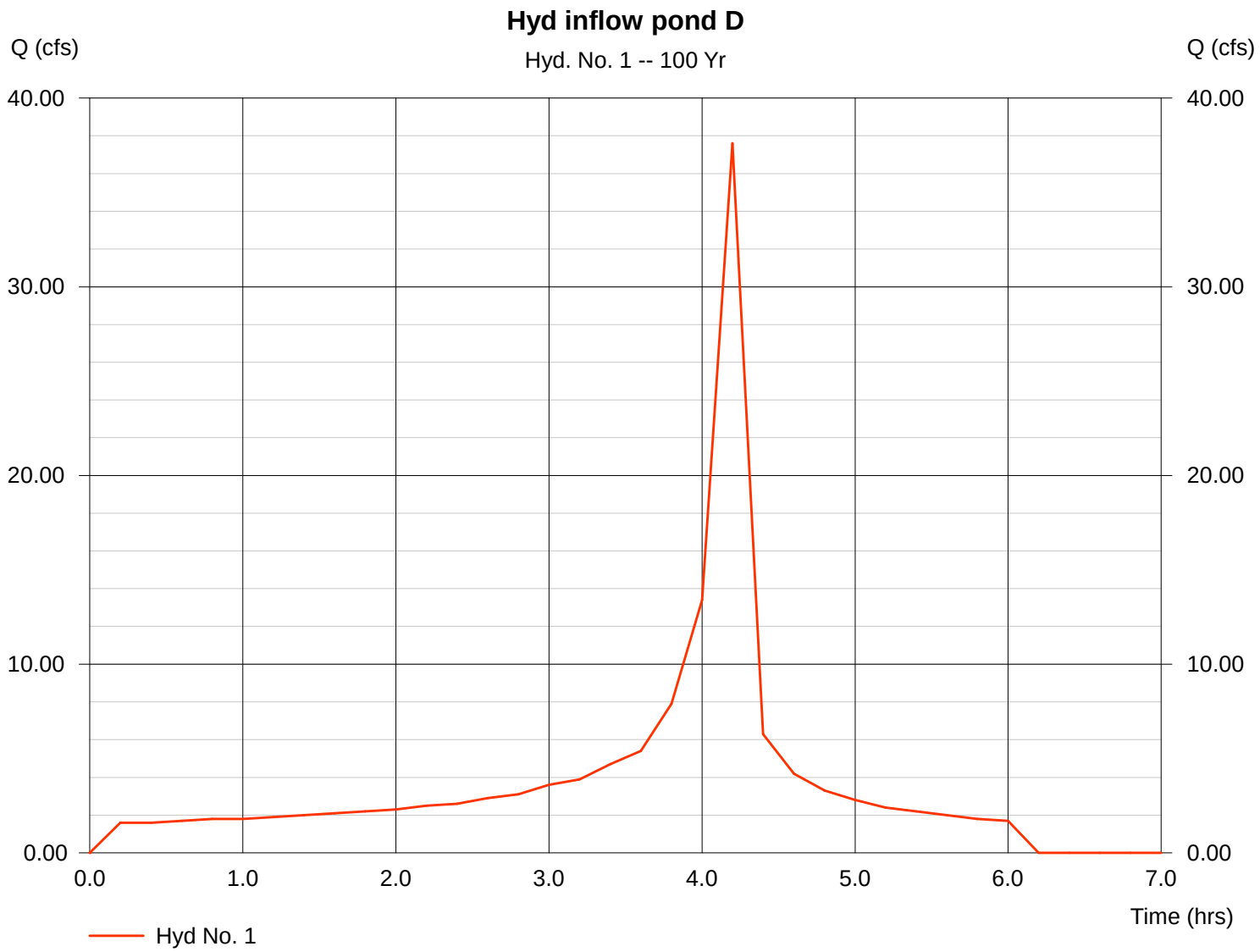
Hydraflow Hydrographs by Intelisolve | Monday, Jul 22 2013, 10:26 AM

## Hyd. No. 1

Hyd inflow pond D

| | | | |
|---|---|---|---|
| Hydrograph type | = Manual | Peak discharge | = 37.60 cfs |
| Storm frequency | = 100 yrs | Time interval | = 12 min |

Hydrograph Volume = 95,976 cuft



# Hydrograph Plot

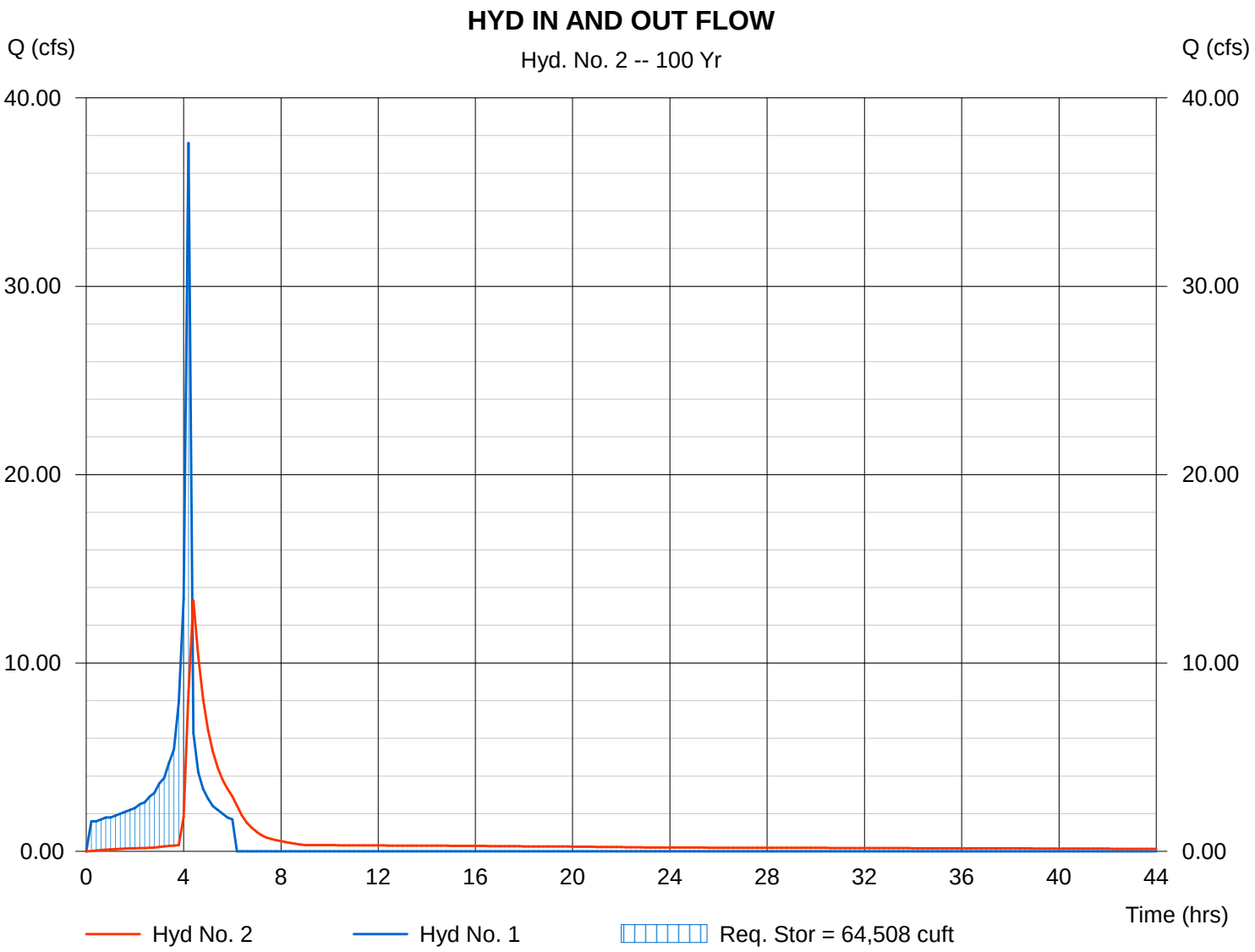
Hydraflow Hydrographs by Intelisolve | Monday, Jul 22 2013, 10:27 AM

## Hyd. No. 2

HYD IN AND OUT FLOW

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph type | = | Reservoir | Peak discharge | = | 13.32 cfs |
| Storm frequency | = | 100 yrs | Time interval | = | 12 min |
| Inflow hyd. No. | = | 1 | Max. Elevation | = | 662.98 ft |
| Reservoir name | = | Bio-pond WQ - D | Max. Storage | = | 64,508 cuft |

Storage Indication method used. | Hydrograph Volume = 95,949 cuft



# Pond Report

Hydraflow Hydrographs by Intelisolve | Monday, Jul 22 2013, 10:28 AM

## Pond No. 1 - Bio-pond WQ - D

## Pond Data

Pond storage is based on known values

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|---|---|---|---|---|
| 0.00 | 657.00 | 00 | 0 | 0 |
| 2.00 | 659.00 | 00 | 9,632 | 9,632 |
| 4.00 | 661.00 | 00 | 11,008 | 20,640 |
| 4.50 | 661.50 | 00 | 7,009 | 27,649 |
| 5.00 | 662.00 | 00 | 7,319 | 34,968 |
| 6.00 | 663.00 | 00 | 30,004 | 64,972 |

### Culvert / Orifice Structures

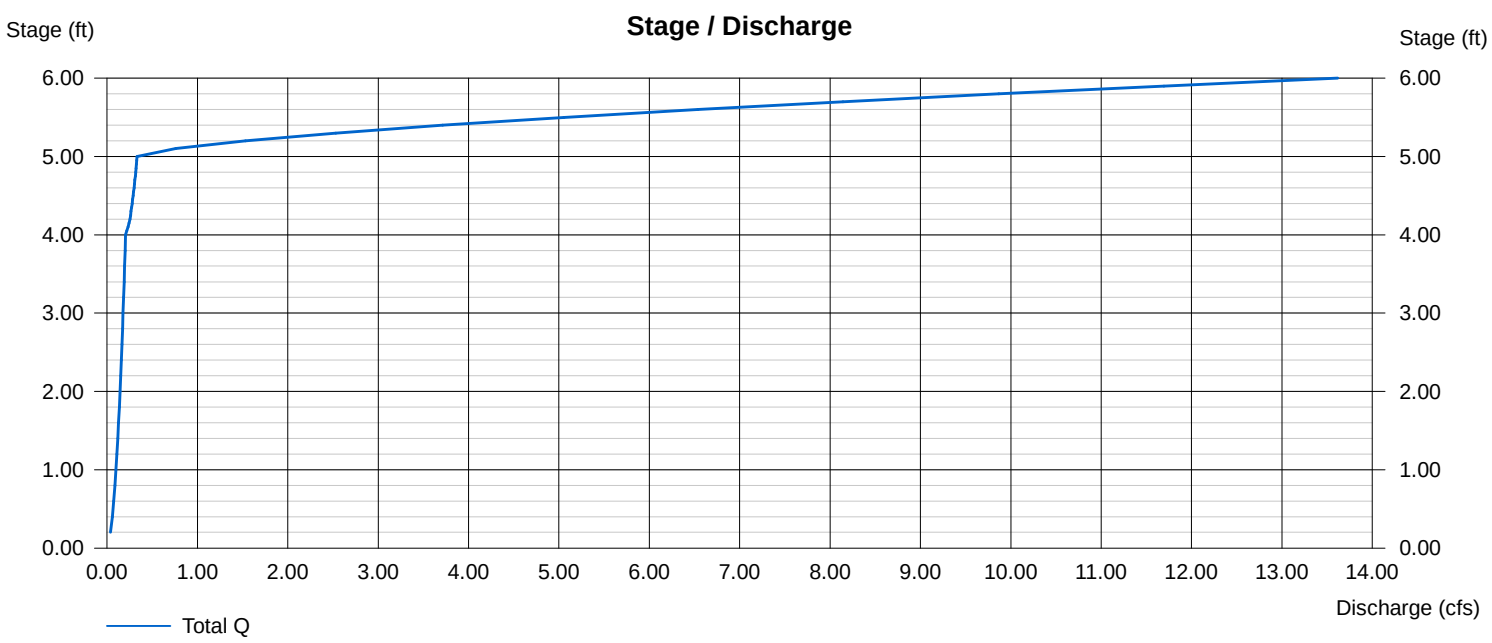
| | | [A] | [B] | [C] | [D] |
|---|---|---|---|---|---|
| **Rise (in)** | = | 18.00 | 2.00 | 1.00 | 0.00 |
| **Span (in)** | = | 18.00 | 2.00 | 1.00 | 0.00 |
| **No. Barrels** | = | 1 | 1 | 4 | 0 |
| **Invert El. (ft)** | = | 657.00 | 657.00 | 661.00 | 0.00 |
| **Length (ft)** | = | 160.00 | 0.00 | 0.00 | 0.00 |
| **Slope (%)** | = | 1.00 | 0.00 | 0.00 | 0.00 |
| **N-Value** | = | .013 | .013 | .013 | .013 |
| **Orif. Coeff.** | = | 0.60 | 0.60 | 0.60 | 0.60 |
| **Multi-Stage** | = | n/a | Yes | Yes | No |

### Weir Structures

| | | [A] | [B] | [C] | [D] |
|---|---|---|---|---|---|
| **Crest Len (ft)** | = | 4.00 | 15.00 | 0.00 | 0.00 |
| **Crest El. (ft)** | = | 662.00 | 663.00 | 0.00 | 0.00 |
| **Weir Coeff.** | = | 3.33 | 3.33 | 0.00 | 0.00 |
| **Weir Type** | = | Riser | Rect | --- | --- |
| **Multi-Stage** | = | Yes | No | No | No |

**Exfiltration =** 0.000 in/hr (Wet area) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2004 Version 7.4

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
        Rational Hydrology Study        Date: 02/18/13
----------------------------------------------------------------------
OUTFALL 3 - STREET A (NW PORTION), ST B, ST C, AND ST D.
POST DEVELOPMENT AFTER DETENTION
100 Year Storm Event
File Name: D12052OUTFALL3.RD3
----------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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


Program License Serial Number 4012

----------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   90.000(Ft.)
Highest elevation =  750.000(Ft.)
Lowest elevation =  745.000(Ft.)
Elevation difference =    5.000(Ft.) Slope =  5.556 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   5.56 %, in a development type of
 10.9 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =   5.70 minutes
 (for slope value of   5.00 %)
Rainfall intensity (I) =      8.474(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.336(CFS)
Total initial stream area =        0.066(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   737.000(Ft.)
Downstream point/station elevation =   732.000(Ft.)
Pipe length  =    54.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.336(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.336(CFS)
```

```
Normal flow depth in pipe =    1.80(In.)
Flow top width inside pipe =    5.50(In.)
Critical Depth =    3.52(In.)
Pipe flow velocity =      6.76(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =     5.83 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        3.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     5.83 min.
Rainfall intensity =      8.349(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.077
Subarea runoff =      0.306(CFS) for      0.062(Ac.)
Total runoff =      0.641(CFS)        Total area =       0.128(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        4.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   732.000(Ft.)
Downstream point/station elevation =   727.000(Ft.)
Pipe length  =    54.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.641(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.641(CFS)
Normal flow depth in pipe =    2.55(In.)
Flow top width inside pipe =    5.93(In.)
Critical Depth =    4.88(In.)
Pipe flow velocity =      8.08(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =     5.94 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        4.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     5.94 min.
Rainfall intensity =      8.248(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.115
Subarea runoff =      0.304(CFS) for      0.063(Ac.)
Total runoff =      0.945(CFS)        Total area =       0.191(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        5.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   727.000(Ft.)
```

```
Downstream point/station elevation =   717.000(Ft.)
Pipe length  =   100.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.945(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.945(CFS)
Normal flow depth in pipe =    3.11(In.)
Flow top width inside pipe =    6.00(In.)
Critical Depth =    5.60(In.)
Pipe flow velocity =      9.18(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =     6.13 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        5.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.13 min.
Rainfall intensity =      8.089(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.160
Subarea runoff =      0.351(CFS) for      0.076(Ac.)
Total runoff =      1.296(CFS)        Total area =       0.267(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        6.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   717.000(Ft.)
Downstream point/station elevation =   710.000(Ft.)
Pipe length  =   110.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.296(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.296(CFS)
Normal flow depth in pipe =    4.51(In.)
Flow top width inside pipe =    5.18(In.)
Critical depth could not be calculated.
Pipe flow velocity =      8.17(Ft/s)
Travel time through pipe =    0.22 min.
Time of concentration (TC) =     6.35 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.000 to Point/Station        6.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.35 min.
Rainfall intensity =      7.904(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.205
Subarea runoff =      0.321(CFS) for      0.074(Ac.)
Total runoff =      1.617(CFS)        Total area =       0.341(Ac.)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.000 to Point/Station        6.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      0.341(Ac.)
Runoff from this stream =      1.617(CFS)
Time of concentration =    6.35 min.
Rainfall intensity =     7.904(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.100 to Point/Station        6.100
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Rainfall intensity (I) =      4.747(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  14.00 min.  Rain intensity =       4.75(In/Hr)
Total area =       30.120(Ac.)  Total runoff =    53.150(CFS)


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Process from Point/Station        6.100 to Point/Station        6.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   695.000(Ft.)
Downstream point/station elevation =   692.400(Ft.)
Pipe length  =   160.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    53.150(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    53.150(CFS)
Normal flow depth in pipe =   22.08(In.)
Flow top width inside pipe =   31.06(In.)
Critical Depth =   28.62(In.)
Pipe flow velocity =     12.57(Ft/s)
Travel time through pipe =    0.21 min.
Time of concentration (TC) =    14.21 min.


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Process from Point/Station        6.000 to Point/Station        6.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     30.120(Ac.)
Runoff from this stream =     53.150(CFS)
Time of concentration =   14.21 min.
Rainfall intensity =     4.701(In/Hr)
Summary of stream data:

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


1        1.617      6.35               7.904
2       53.150     14.21               4.701
Qmax(1) =
          1.000 *    1.000 *     1.617) +
          1.000 *    0.447 *    53.150) + =      25.367
Qmax(2) =
          0.595 *    1.000 *     1.617) +
          1.000 *    1.000 *    53.150) + =      54.112
```

```
Total of 2 streams to confluence:
Flow rates before confluence point:
       1.617      53.150
Maximum flow rates at confluence using above data:
       25.367       54.112
Area of streams before confluence:
        0.341       30.120
Results of confluence:
Total flow rate =     54.112(CFS)
Time of concentration =    14.212 min.
Effective stream area after confluence =     30.461(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.000 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   692.400(Ft.)
Downstream point/station elevation =   692.000(Ft.)
Pipe length  =    10.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    54.112(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    54.112(CFS)
Normal flow depth in pipe =   19.55(In.)
Flow top width inside pipe =   24.14(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.56(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =    14.22 min.


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Process from Point/Station       13.000 to Point/Station       13.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     30.461(Ac.)
Runoff from this stream =     54.112(CFS)
Time of concentration =   14.22 min.
Rainfall intensity =     4.699(In/Hr)


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Process from Point/Station        1.000 to Point/Station        7.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   94.000(Ft.)
Highest elevation =  750.000(Ft.)
Lowest elevation =  745.000(Ft.)
Elevation difference =    5.000(Ft.) Slope =  5.319 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   5.32 %, in a development type of
 10.9 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =   5.70 minutes
 (for slope value of   5.00 %)
Rainfall intensity (I) =      8.474(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.422(CFS)
Total initial stream area =        0.083(Ac.)
```

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Process from Point/Station        7.000 to Point/Station        8.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________
Upstream point/station elevation =   737.000(Ft.)
Downstream point/station elevation =   733.000(Ft.)
Pipe length  =    54.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.422(CFS)
Given pipe size =      6.00(In.)
Calculated individual pipe flow  =     0.422(CFS)
Normal flow depth in pipe =    2.16(In.)
Flow top width inside pipe =    5.76(In.)
Critical Depth =    3.97(In.)
Pipe flow velocity =      6.65(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     5.84 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        8.000 to Point/Station        8.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     5.84 min.
Rainfall intensity =      8.347(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.086
Subarea runoff =      0.299(CFS) for      0.061(Ac.)
Total runoff =      0.721(CFS)        Total area =       0.144(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        8.000 to Point/Station        9.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________
Upstream point/station elevation =   733.000(Ft.)
Downstream point/station elevation =   729.000(Ft.)
Pipe length  =    50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.721(CFS)
Given pipe size =      6.00(In.)
Calculated individual pipe flow  =     0.721(CFS)
Normal flow depth in pipe =    2.84(In.)
Flow top width inside pipe =    5.99(In.)
Critical Depth =    5.12(In.)
Pipe flow velocity =      7.89(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =     5.94 min.


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Process from Point/Station        9.000 to Point/Station        9.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     5.94 min.
Rainfall intensity =      8.251(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
```

```
(Q=KCIA) is C = 0.600  CA =      0.118
Subarea runoff =      0.254(CFS) for      0.053(Ac.)
Total runoff =      0.975(CFS)        Total area =       0.197(Ac.)


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Process from Point/Station        9.000 to Point/Station       10.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   729.000(Ft.)
Downstream point/station elevation =   722.000(Ft.)
Pipe length  =    77.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.975(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.975(CFS)
Normal flow depth in pipe =    3.27(In.)
Flow top width inside pipe =    5.98(In.)
Critical Depth =    5.64(In.)
Pipe flow velocity =      8.92(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     6.08 min.


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Process from Point/Station       10.000 to Point/Station       10.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.08 min.
Rainfall intensity =      8.125(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.151
Subarea runoff =      0.248(CFS) for      0.054(Ac.)
Total runoff =      1.224(CFS)        Total area =       0.251(Ac.)


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Process from Point/Station       10.000 to Point/Station       11.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   722.000(Ft.)
Downstream point/station elevation =   712.000(Ft.)
Pipe length  =    99.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.224(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.224(CFS)
Normal flow depth in pipe =    3.65(In.)
Flow top width inside pipe =    5.86(In.)
Critical depth could not be calculated.
Pipe flow velocity =      9.79(Ft/s)
Travel time through pipe =    0.17 min.
Time of concentration (TC) =     6.25 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       11.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
```

```
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.25 min.
Rainfall intensity =      7.983(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.191
Subarea runoff =      0.304(CFS) for      0.068(Ac.)
Total runoff =      1.528(CFS)        Total area =       0.319(Ac.)


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Process from Point/Station       11.000 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   712.000(Ft.)
Downstream point/station elevation =   709.000(Ft.)
Pipe length  =    99.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.528(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.528(CFS)
Normal flow depth in pipe =    4.66(In.)
Flow top width inside pipe =    8.99(In.)
Critical Depth =    6.83(In.)
Pipe flow velocity =      6.62(Ft/s)
Travel time through pipe =    0.25 min.
Time of concentration (TC) =     6.50 min.


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Process from Point/Station       12.000 to Point/Station       12.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     6.50 min.
Rainfall intensity =      7.784(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.224
Subarea runoff =      0.219(CFS) for      0.055(Ac.)
Total runoff =      1.747(CFS)        Total area =       0.374(Ac.)


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Process from Point/Station       12.000 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   709.000(Ft.)
Downstream point/station elevation =   692.000(Ft.)
Pipe length  =    34.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.747(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.747(CFS)
Normal flow depth in pipe =    2.79(In.)
Flow top width inside pipe =    5.98(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.57(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     6.53 min.


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Process from Point/Station       13.000 to Point/Station       13.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
```

```
Stream flow area =      0.374(Ac.)
Runoff from this stream =      1.747(CFS)
Time of concentration =    6.53 min.
Rainfall intensity =     7.761(In/Hr)
Summary of stream data:

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


1       54.112     14.22               4.699
2        1.747      6.53               7.761
Qmax(1) =
          1.000 *    1.000 *    54.112) +
          0.605 *    1.000 *     1.747) + =      55.169
Qmax(2) =
          1.000 *    0.459 *    54.112) +
          1.000 *    1.000 *     1.747) + =      26.600

Total of 2 streams to confluence:
Flow rates before confluence point:
      54.112       1.747
Maximum flow rates at confluence using above data:
       55.169       26.600
Area of streams before confluence:
       30.461        0.374
Results of confluence:
Total flow rate =     55.169(CFS)
Time of concentration =    14.222 min.
Effective stream area after confluence =     30.835(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   692.000(Ft.)
Downstream point/station elevation =   691.300(Ft.)
Pipe length  =    83.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    55.169(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    55.169(CFS)
Normal flow depth in pipe =   26.72(In.)
Flow top width inside pipe =   31.49(In.)
Critical Depth =   28.94(In.)
Pipe flow velocity =      9.81(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =    14.36 min.


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Process from Point/Station       14.000 to Point/Station       14.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
The area added to the existing stream causes a
a lower flow rate of Q =     51.409(CFS)
therefore the upstream flow rate of Q =     55.169(CFS) is being used
Time of concentration =    14.36 min.
Rainfall intensity =      4.669(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.356  CA =     11.011
Subarea runoff =      0.000(CFS) for      0.066(Ac.)
Total runoff =     55.169(CFS)        Total area =      30.901(Ac.)
```

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Process from Point/Station       14.000 to Point/Station       14.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     30.901(Ac.)
Runoff from this stream =     55.169(CFS)
Time of concentration =   14.36 min.
Rainfall intensity =     4.669(In/Hr)


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Process from Point/Station        6.000 to Point/Station       14.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   83.000(Ft.)
Highest elevation =  715.000(Ft.)
Lowest elevation =  707.000(Ft.)
Elevation difference =    8.000(Ft.) Slope =  9.639 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   9.64 %, in a development type of
 10.9 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =   4.50 minutes
 (for slope value of  10.00 %)
Calculated TC of    4.500 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.365(CFS)
Total initial stream area =        0.066(Ac.)


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Process from Point/Station       14.000 to Point/Station       14.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.066(Ac.)
Runoff from this stream =      0.365(CFS)
Time of concentration =    4.50 min.
Rainfall intensity =     9.222(In/Hr)
Summary of stream data:

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


1       55.169     14.36               4.669
2        0.365      4.50               9.222
Qmax(1) =
          1.000 *    1.000 *    55.169) +
          0.506 *    1.000 *     0.365) + =      55.354
Qmax(2) =
          1.000 *    0.313 *    55.169) +
          1.000 *    1.000 *     0.365) + =      17.650

Total of 2 streams to confluence:
Flow rates before confluence point:
      55.169       0.365
```

```
Maximum flow rates at confluence using above data:
       55.354       17.650
Area of streams before confluence:
       30.901        0.066
Results of confluence:
Total flow rate =     55.354(CFS)
Time of concentration =    14.363 min.
Effective stream area after confluence =     30.967(Ac.)


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Process from Point/Station       14.000 to Point/Station       19.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   691.300(Ft.)
Downstream point/station elevation =   690.700(Ft.)
Pipe length  =    58.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    55.354(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    55.354(CFS)
Normal flow depth in pipe =   24.70(In.)
Flow top width inside pipe =   33.41(In.)
Critical Depth =   28.97(In.)
Pipe flow velocity =     10.70(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =    14.45 min.


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Process from Point/Station       19.000 to Point/Station       19.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     30.967(Ac.)
Runoff from this stream =     55.354(CFS)
Time of concentration =   14.45 min.
Rainfall intensity =     4.650(In/Hr)


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Process from Point/Station       12.000 to Point/Station       17.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =   74.000(Ft.)
Highest elevation =  713.000(Ft.)
Lowest elevation =  706.000(Ft.)
Elevation difference =    7.000(Ft.) Slope =  9.459 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   9.46 %, in a development type of
 10.9 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =   4.50 minutes
 (for slope value of  10.00 %)
Calculated TC of    4.500 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.315(CFS)
Total initial stream area =        0.057(Ac.)


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Process from Point/Station       17.000 to Point/Station       18.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   700.000(Ft.)
Downstream point/station elevation =   695.000(Ft.)
Pipe length  =    52.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.315(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.315(CFS)
Normal flow depth in pipe =    1.73(In.)
Flow top width inside pipe =    5.43(In.)
Critical Depth =    3.41(In.)
Pipe flow velocity =      6.72(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =     4.63 min.


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Process from Point/Station       18.000 to Point/Station       18.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     4.63 min.
Rainfall intensity =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.056
Subarea runoff =      0.205(CFS) for      0.037(Ac.)
Total runoff =      0.520(CFS)        Total area =       0.094(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       18.000 to Point/Station       19.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   695.000(Ft.)
Downstream point/station elevation =   690.700(Ft.)
Pipe length  =    38.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.520(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.520(CFS)
Normal flow depth in pipe =    2.16(In.)
Flow top width inside pipe =    5.76(In.)
Critical Depth =    4.41(In.)
Pipe flow velocity =      8.21(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =     4.71 min.


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Process from Point/Station       19.000 to Point/Station       19.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.094(Ac.)
Runoff from this stream =      0.520(CFS)
Time of concentration =    4.71 min.
Rainfall intensity =     9.222(In/Hr)
Summary of stream data:

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


1       55.354     14.45               4.650
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```
2        0.520      4.71               9.222
Qmax(1) =
          1.000 *    1.000 *    55.354) +
          0.504 *    1.000 *     0.520) + =      55.616
Qmax(2) =
          1.000 *    0.326 *    55.354) +
          1.000 *    1.000 *     0.520) + =      18.544

Total of 2 streams to confluence:
Flow rates before confluence point:
      55.354       0.520
Maximum flow rates at confluence using above data:
       55.616       18.544
Area of streams before confluence:
       30.967        0.094
Results of confluence:
Total flow rate =     55.616(CFS)
Time of concentration =    14.453 min.
Effective stream area after confluence =     31.061(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       19.000 to Point/Station       15.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   690.700(Ft.)
Downstream point/station elevation =   690.000(Ft.)
Pipe length  =    41.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    55.616(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    55.616(CFS)
Normal flow depth in pipe =   22.43(In.)
Flow top width inside pipe =   30.80(In.)
Critical Depth =   29.11(In.)
Pipe flow velocity =     12.94(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    14.51 min.


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Process from Point/Station       15.000 to Point/Station       15.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
The area added to the existing stream causes a
a lower flow rate of Q =     51.729(CFS)
therefore the upstream flow rate of Q =     55.616(CFS) is being used
Time of concentration =    14.51 min.
Rainfall intensity =      4.639(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.358  CA =     11.150
Subarea runoff =      0.000(CFS) for      0.073(Ac.)
Total runoff =     55.616(CFS)        Total area =      31.134(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.000 to Point/Station       21.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   690.000(Ft.)
Downstream point/station elevation =   687.000(Ft.)
Pipe length  =    62.50(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    55.616(CFS)
Nearest computed pipe diameter  =     27.00(In.)
```

```
Calculated individual pipe flow  =    55.616(CFS)
Normal flow depth in pipe =   18.61(In.)
Flow top width inside pipe =   24.99(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.04(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    14.56 min.


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Process from Point/Station       21.000 to Point/Station       21.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     31.134(Ac.)
Runoff from this stream =     55.616(CFS)
Time of concentration =   14.56 min.
Rainfall intensity =     4.628(In/Hr)


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Process from Point/Station       18.000 to Point/Station       20.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  101.000(Ft.)
Highest elevation =  701.000(Ft.)
Lowest elevation =  693.000(Ft.)
Elevation difference =    8.000(Ft.) Slope =  7.921 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   7.92 %, in a development type of
 10.9 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =   4.50 minutes
 (for slope value of  10.00 %)
Calculated TC of    4.500 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      9.222(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.404(CFS)
Total initial stream area =        0.073(Ac.)


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Process from Point/Station       20.000 to Point/Station       21.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   688.000(Ft.)
Downstream point/station elevation =   687.000(Ft.)
Pipe length  =    40.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.404(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.404(CFS)
Normal flow depth in pipe =    2.84(In.)
Flow top width inside pipe =    5.99(In.)
Critical Depth =    3.88(In.)
Pipe flow velocity =      4.41(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =     4.65 min.


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Process from Point/Station       21.000 to Point/Station       21.000
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**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.073(Ac.)
Runoff from this stream =      0.404(CFS)
Time of concentration =    4.65 min.
Rainfall intensity =     9.222(In/Hr)
Summary of stream data:

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


1       55.616     14.56               4.628
2        0.404      4.65               9.222
Qmax(1) =
          1.000 *    1.000 *    55.616) +
          0.502 *    1.000 *     0.404) + =      55.819
Qmax(2) =
          1.000 *    0.319 *    55.616) +
          1.000 *    1.000 *     0.404) + =      18.170

Total of 2 streams to confluence:
Flow rates before confluence point:
      55.616       0.404
Maximum flow rates at confluence using above data:
       55.819       18.170
Area of streams before confluence:
       31.134        0.073
Results of confluence:
Total flow rate =     55.819(CFS)
Time of concentration =    14.560 min.
Effective stream area after confluence =     31.207(Ac.)


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Process from Point/Station       21.000 to Point/Station       16.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________
Upstream point/station elevation =   687.000(Ft.)
Downstream point/station elevation =   686.800(Ft.)
Pipe length  =    12.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    55.819(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    55.819(CFS)
Normal flow depth in pipe =   22.69(In.)
Flow top width inside pipe =   30.59(In.)
Critical Depth =   29.16(In.)
Pipe flow velocity =     12.82(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =    14.58 min.


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Process from Point/Station       16.000 to Point/Station       16.000
**** SUBAREA FLOW ADDITION ****
____________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
The area added to the existing stream causes a
a lower flow rate of Q =     51.921(CFS)
therefore the upstream flow rate of Q =     55.819(CFS) is being used
Time of concentration =    14.58 min.
Rainfall intensity =      4.625(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
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```
(Q=KCIA) is C = 0.359  CA =     11.227
Subarea runoff =      0.000(CFS) for      0.054(Ac.)
Total runoff =     55.819(CFS)       Total area =      31.261(Ac.)


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Process from Point/Station       16.000 to Point/Station       43.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   686.800(Ft.)
Downstream point/station elevation =   684.000(Ft.)
Pipe length  =    12.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    55.819(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    55.819(CFS)
Normal flow depth in pipe =   13.31(In.)
Flow top width inside pipe =   20.23(In.)
Critical depth could not be calculated.
Pipe flow velocity =     34.73(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =    14.58 min.


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Process from Point/Station       43.000 to Point/Station       43.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     31.261(Ac.)
Runoff from this stream =     55.819(CFS)
Time of concentration =   14.58 min.
Rainfall intensity =     4.624(In/Hr)


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Process from Point/Station       43.000 to Point/Station       43.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      4.036(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  18.00 min.  Rain intensity =       4.04(In/Hr)
Total area =        3.835(Ac.)  Total runoff =     7.240(CFS)


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Process from Point/Station       43.000 to Point/Station       43.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.835(Ac.)
Runoff from this stream =      7.240(CFS)
Time of concentration =   18.00 min.
Rainfall intensity =     4.036(In/Hr)
Summary of stream data:

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


1       55.819     14.58               4.624
2        7.240     18.00               4.036
Qmax(1) =
          1.000 *    1.000 *    55.819) +
```

```
          1.000 *    0.810 *     7.240) + =      61.684
Qmax(2) =
          0.873 *    1.000 *    55.819) +
          1.000 *    1.000 *     7.240) + =      55.969

Total of 2 streams to confluence:
Flow rates before confluence point:
      55.819       7.240
Maximum flow rates at confluence using above data:
       61.684       55.969
Area of streams before confluence:
       31.261        3.835
Results of confluence:
Total flow rate =     61.684(CFS)
Time of concentration =    14.582 min.
Effective stream area after confluence =     35.096(Ac.)


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Process from Point/Station       43.000 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   684.600(Ft.)
Downstream point/station elevation =   680.500(Ft.)
Pipe length  =    81.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    61.684(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    61.684(CFS)
Normal flow depth in pipe =   19.76(In.)
Flow top width inside pipe =   23.92(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.79(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    14.65 min.


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Process from Point/Station       22.000 to Point/Station       22.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =    14.65 min.
Rainfall intensity =      4.610(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.386  CA =     13.572
Subarea runoff =      0.879(CFS) for      0.074(Ac.)
Total runoff =     62.563(CFS)       Total area =      35.170(Ac.)


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Process from Point/Station       22.000 to Point/Station       24.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   680.500(Ft.)
Downstream point/station elevation =   674.300(Ft.)
Pipe length  =    80.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    62.563(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    62.563(CFS)
Normal flow depth in pipe =   19.55(In.)
Flow top width inside pipe =   18.66(In.)
Critical depth could not be calculated.
Pipe flow velocity =     22.85(Ft/s)
Travel time through pipe =    0.06 min.
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```
Time of concentration (TC) =    14.71 min.


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Process from Point/Station       24.000 to Point/Station       24.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     35.170(Ac.)
Runoff from this stream =     62.563(CFS)
Time of concentration =   14.71 min.
Rainfall intensity =     4.598(In/Hr)


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Process from Point/Station       20.000 to Point/Station       23.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  191.000(Ft.)
Highest elevation =  693.000(Ft.)
Lowest elevation =  680.000(Ft.)
Elevation difference =   13.000(Ft.) Slope =  6.806 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   6.81 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.75 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*( 100.000^.5)/(   6.806^(1/3)]=   4.75
Rainfall intensity (I) =      9.533(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.949(CFS)
Total initial stream area =        0.166(Ac.)


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Process from Point/Station       23.000 to Point/Station       24.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   675.500(Ft.)
Downstream point/station elevation =   674.300(Ft.)
Pipe length  =    33.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.949(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.949(CFS)
Normal flow depth in pipe =    4.39(In.)
Flow top width inside pipe =    5.31(In.)
Critical Depth =    5.60(In.)
Pipe flow velocity =      6.15(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =     4.84 min.


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Process from Point/Station       24.000 to Point/Station       24.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.166(Ac.)
Runoff from this stream =      0.949(CFS)
Time of concentration =    4.84 min.
Rainfall intensity =     9.419(In/Hr)
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Summary of stream data:

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


1       62.563     14.71               4.598
2        0.949      4.84               9.419
Qmax(1) =
          1.000 *    1.000 *    62.563) +
          0.488 *    1.000 *     0.949) + =      63.027
Qmax(2) =
          1.000 *    0.329 *    62.563) +
          1.000 *    1.000 *     0.949) + =      21.530

Total of 2 streams to confluence:
Flow rates before confluence point:
      62.563       0.949
Maximum flow rates at confluence using above data:
       63.027       21.530
Area of streams before confluence:
       35.170        0.166
Results of confluence:
Total flow rate =     63.027(CFS)
Time of concentration =    14.708 min.
Effective stream area after confluence =     35.336(Ac.)


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Process from Point/Station       24.000 to Point/Station       25.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   674.300(Ft.)
Downstream point/station elevation =   673.500(Ft.)
Pipe length  =    50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    63.027(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    63.027(CFS)
Normal flow depth in pipe =   25.50(In.)
Flow top width inside pipe =   27.66(In.)
Critical Depth =   30.29(In.)
Pipe flow velocity =     12.81(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    14.77 min.


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Process from Point/Station       25.000 to Point/Station       25.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     35.336(Ac.)
Runoff from this stream =     63.027(CFS)
Time of concentration =   14.77 min.
Rainfall intensity =     4.585(In/Hr)


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Process from Point/Station       25.200 to Point/Station       25.100
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  237.000(Ft.)
Highest elevation =  732.000(Ft.)
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Lowest elevation =  710.500(Ft.)
Elevation difference =   21.500(Ft.) Slope =  9.072 %
Top of Initial Area Slope adjusted by User to 11.400 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  11.40 %, in a development type of
 Permanent Open Space
In Accordance With Table 3-2
Initial Area Time of Concentration =   6.90 minutes
 (for slope value of  10.00 %)
Rainfall intensity (I) =      7.492(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =      6.975(CFS)
Total initial stream area =        2.660(Ac.)


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Process from Point/Station       25.100 to Point/Station       25.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   705.000(Ft.)
Downstream point/station elevation =   673.500(Ft.)
Pipe length  =   193.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.975(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     6.975(CFS)
Normal flow depth in pipe =    5.89(In.)
Flow top width inside pipe =   12.00(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.18(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =     7.08 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.000 to Point/Station       25.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.660(Ac.)
Runoff from this stream =      6.975(CFS)
Time of concentration =    7.08 min.
Rainfall intensity =     7.370(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       25.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  130.000(Ft.)
Highest elevation =  685.000(Ft.)
Lowest elevation =  678.000(Ft.)
Elevation difference =    7.000(Ft.) Slope =  5.385 %
Top of Initial Area Slope adjusted by User to  5.750 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   5.75 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.02 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*( 100.000^.5)/(   5.750^(1/3)]=   5.02
Rainfall intensity (I) =      9.194(In/Hr) for a   100.0 year storm
```

```
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.530(CFS)
Total initial stream area =        0.096(Ac.)


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Process from Point/Station       25.000 to Point/Station       25.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.096(Ac.)
Runoff from this stream =      0.530(CFS)
Time of concentration =    5.02 min.
Rainfall intensity =     9.194(In/Hr)
Summary of stream data:

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


1       63.027     14.77               4.585
2        6.975      7.08               7.370
3        0.530      5.02               9.194
Qmax(1) =
          1.000 *    1.000 *    63.027) +
          0.622 *    1.000 *     6.975) +
          0.499 *    1.000 *     0.530) + =      67.630
Qmax(2) =
          1.000 *    0.479 *    63.027) +
          1.000 *    1.000 *     6.975) +
          0.802 *    1.000 *     0.530) + =      37.591
Qmax(3) =
          1.000 *    0.340 *    63.027) +
          1.000 *    0.710 *     6.975) +
          1.000 *    1.000 *     0.530) + =      26.913

Total of 3 streams to confluence:
Flow rates before confluence point:
      63.027       6.975       0.530
Maximum flow rates at confluence using above data:
       67.630       37.591       26.913
Area of streams before confluence:
       35.336        2.660        0.096
Results of confluence:
Total flow rate =     67.630(CFS)
Time of concentration =    14.773 min.
Effective stream area after confluence =     38.092(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.000 to Point/Station       26.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   673.500(Ft.)
Downstream point/station elevation =   669.000(Ft.)
Pipe length  =   111.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    67.630(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    67.630(CFS)
Normal flow depth in pipe =   20.65(In.)
Flow top width inside pipe =   27.79(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.77(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =    14.87 min.


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Process from Point/Station       26.000 to Point/Station       26.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
The area added to the existing stream causes a
a lower flow rate of Q =     67.198(CFS)
therefore the upstream flow rate of Q =     67.630(CFS) is being used
Time of concentration =    14.87 min.
Rainfall intensity =      4.565(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.385  CA =     14.720
Subarea runoff =      0.000(CFS) for      0.099(Ac.)
Total runoff =     67.630(CFS)        Total area =      38.191(Ac.)


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Process from Point/Station       26.000 to Point/Station       26.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     38.191(Ac.)
Runoff from this stream =     67.630(CFS)
Time of concentration =   14.87 min.
Rainfall intensity =     4.565(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.000 to Point/Station       26.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  110.000(Ft.)
Highest elevation =  678.000(Ft.)
Lowest elevation =  673.500(Ft.)
Elevation difference =    4.500(Ft.) Slope =  4.091 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   4.09 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.63 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*( 100.000^.5)/(   4.091^(1/3)]=   5.63
Rainfall intensity (I) =      8.545(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.508(CFS)
Total initial stream area =        0.099(Ac.)


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Process from Point/Station       26.000 to Point/Station       26.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.099(Ac.)
Runoff from this stream =      0.508(CFS)
Time of concentration =    5.63 min.
Rainfall intensity =     8.545(In/Hr)
Summary of stream data:
```

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


1       67.630     14.87               4.565
2        0.508      5.63               8.545
Qmax(1) =
          1.000 *    1.000 *    67.630) +
          0.534 *    1.000 *     0.508) + =      67.901
Qmax(2) =
          1.000 *    0.378 *    67.630) +
          1.000 *    1.000 *     0.508) + =      26.097

Total of 2 streams to confluence:
Flow rates before confluence point:
      67.630       0.508
Maximum flow rates at confluence using above data:
       67.901       26.097
Area of streams before confluence:
       38.191        0.099
Results of confluence:
Total flow rate =     67.901(CFS)
Time of concentration =    14.872 min.
Effective stream area after confluence =     38.290(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.000 to Point/Station       63.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   669.000(Ft.)
Downstream point/station elevation =   662.000(Ft.)
Pipe length  =   148.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    67.901(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    67.901(CFS)
Normal flow depth in pipe =   19.59(In.)
Flow top width inside pipe =   28.56(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.00(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =    15.00 min.


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Process from Point/Station       63.000 to Point/Station       63.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     38.290(Ac.)
Runoff from this stream =     67.901(CFS)
Time of concentration =   15.00 min.
Rainfall intensity =     4.541(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       27.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  111.000(Ft.)
Highest elevation =  680.000(Ft.)
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Lowest elevation =  675.000(Ft.)
Elevation difference =    5.000(Ft.) Slope =  4.505 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   4.50 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.45 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*( 100.000^.5)/(   4.505^(1/3)]=   5.45
Rainfall intensity (I) =      8.724(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.445(CFS)
Total initial stream area =        0.085(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       27.000 to Point/Station       28.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   670.000(Ft.)
Downstream point/station elevation =   664.000(Ft.)
Pipe length  =    76.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.445(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.445(CFS)
Normal flow depth in pipe =    2.18(In.)
Flow top width inside pipe =    5.77(In.)
Critical Depth =    4.08(In.)
Pipe flow velocity =      6.90(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =     5.63 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       28.000 to Point/Station       28.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     5.63 min.
Rainfall intensity =      8.539(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.085
Subarea runoff =      0.278(CFS) for      0.056(Ac.)
Total runoff =      0.722(CFS)        Total area =       0.141(Ac.)


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Process from Point/Station       28.000 to Point/Station       29.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   664.000(Ft.)
Downstream point/station elevation =   663.000(Ft.)
Pipe length  =    66.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.722(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.722(CFS)
Normal flow depth in pipe =    3.70(In.)
Flow top width inside pipe =    8.86(In.)
Critical Depth =    4.65(In.)
Pipe flow velocity =      4.22(Ft/s)
Travel time through pipe =    0.26 min.
Time of concentration (TC) =     5.89 min.
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Process from Point/Station       29.000 to Point/Station       29.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Time of concentration =     5.89 min.
Rainfall intensity =      8.293(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.600  CA =      0.122
Subarea runoff =      0.288(CFS) for      0.062(Ac.)
Total runoff =      1.010(CFS)        Total area =       0.203(Ac.)


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Process from Point/Station       29.000 to Point/Station       29.100
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   663.000(Ft.)
Downstream point/station elevation =   662.500(Ft.)
Pipe length  =    32.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.010(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.010(CFS)
Normal flow depth in pipe =    4.44(In.)
Flow top width inside pipe =    9.00(In.)
Critical Depth =    5.53(In.)
Pipe flow velocity =      4.65(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =     6.01 min.


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Process from Point/Station       29.100 to Point/Station       29.100
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      0.203(Ac.)
Runoff from this stream =      1.010(CFS)
Time of concentration =    6.01 min.
Rainfall intensity =     8.191(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       62.000 to Point/Station       62.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      6.312(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   9.00 min.  Rain intensity =       6.31(In/Hr)
Total area =       51.810(Ac.)  Total runoff =   132.660(CFS)


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Process from Point/Station       62.000 to Point/Station       29.100
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
```

```
Upstream point/station elevation =   663.000(Ft.)
Downstream point/station elevation =   662.500(Ft.)
Pipe length  =    34.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   132.660(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =   132.660(CFS)
Normal flow depth in pipe =   33.52(In.)
Flow top width inside pipe =   39.24(In.)
Critical Depth =   40.96(In.)
Pipe flow velocity =     15.04(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =     9.04 min.


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Process from Point/Station       29.100 to Point/Station       29.100
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     51.810(Ac.)
Runoff from this stream =    132.660(CFS)
Time of concentration =    9.04 min.
Rainfall intensity =     6.295(In/Hr)
Summary of stream data:

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


1        1.010      6.01               8.191
2      132.660      9.04               6.295
Qmax(1) =
          1.000 *    1.000 *     1.010) +
          1.000 *    0.665 *   132.660) + =      89.205
Qmax(2) =
          0.768 *    1.000 *     1.010) +
          1.000 *    1.000 *   132.660) + =     133.436

Total of 2 streams to confluence:
Flow rates before confluence point:
       1.010     132.660
Maximum flow rates at confluence using above data:
       89.205      133.436
Area of streams before confluence:
        0.203       51.810
Results of confluence:
Total flow rate =    133.436(CFS)
Time of concentration =     9.038 min.
Effective stream area after confluence =     52.013(Ac.)


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Process from Point/Station       29.100 to Point/Station       63.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   662.500(Ft.)
Downstream point/station elevation =   662.000(Ft.)
Pipe length  =    36.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   133.436(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =   133.436(CFS)
Normal flow depth in pipe =   34.55(In.)
Flow top width inside pipe =   38.01(In.)
Critical Depth =   41.03(In.)
Pipe flow velocity =     14.67(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =     9.08 min.


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Process from Point/Station       63.000 to Point/Station       63.000
**** CONFLUENCE OF MAIN STREAMS ****
____________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     52.013(Ac.)
Runoff from this stream =    133.436(CFS)
Time of concentration =    9.08 min.
Rainfall intensity =     6.277(In/Hr)
Summary of stream data:

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


1       67.901     15.00               4.541
2      133.436      9.08               6.277
Qmax(1) =
          1.000 *    1.000 *    67.901) +
          0.723 *    1.000 *   133.436) + =     164.440
Qmax(2) =
          1.000 *    0.605 *    67.901) +
          1.000 *    1.000 *   133.436) + =     174.545

Total of 2 main streams to confluence:
Flow rates before confluence point:
      67.901     133.436
Maximum flow rates at confluence using above data:
      164.440      174.545
Area of streams before confluence:
       38.290       52.013


Results of confluence:
Total flow rate =    174.545(CFS)
Time of concentration =     9.079 min.
Effective stream area after confluence  =     90.303(Ac.)


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Process from Point/Station       63.000 to Point/Station       66.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________
Upstream point/station elevation =   662.000(Ft.)
Downstream point/station elevation =   661.000(Ft.)
Pipe length  =   114.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   174.545(CFS)
Nearest computed pipe diameter  =     54.00(In.)
Calculated individual pipe flow  =   174.545(CFS)
Normal flow depth in pipe =   41.91(In.)
Flow top width inside pipe =   45.02(In.)
Critical Depth =   46.03(In.)
Pipe flow velocity =     13.18(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     9.22 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 =     90.303(Ac.)
Runoff from this stream =    174.545(CFS)
Time of concentration =    9.22 min.
Rainfall intensity =     6.213(In/Hr)


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Process from Point/Station       26.000 to Point/Station       65.000
**** INITIAL AREA EVALUATION ****
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  262.000(Ft.)
Highest elevation =  673.500(Ft.)
Lowest elevation =  669.000(Ft.)
Elevation difference =    4.500(Ft.) Slope =  1.718 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 80.00 (Ft)
for the top area slope value of   1.72 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.72 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  80.000^.5)/(   1.718^(1/3)]=   6.72
Rainfall intensity (I) =      7.620(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.960(CFS)
Total initial stream area =        0.210(Ac.)


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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 2
Stream flow area =      0.210(Ac.)
Runoff from this stream =      0.960(CFS)
Time of concentration =    6.72 min.
Rainfall intensity =     7.620(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       29.000 to Point/Station       64.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  163.000(Ft.)
Highest elevation =  670.500(Ft.)
Lowest elevation =  668.500(Ft.)
Elevation difference =    2.000(Ft.) Slope =  1.227 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 65.00 (Ft)
for the top area slope value of   1.23 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.78 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  65.000^.5)/(   1.227^(1/3)]=   6.78
Rainfall intensity (I) =      7.579(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      0.950(CFS)
Total initial stream area =        0.209(Ac.)


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Process from Point/Station       64.000 to Point/Station       66.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
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Upstream point/station elevation =   664.000(Ft.)
Downstream point/station elevation =   661.000(Ft.)
Pipe length  =    37.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.950(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.950(CFS)
Normal flow depth in pipe =    3.33(In.)
Flow top width inside pipe =    5.96(In.)
Critical Depth =    5.61(In.)
Pipe flow velocity =      8.49(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =     6.85 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       66.000 to Point/Station       66.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.209(Ac.)
Runoff from this stream =      0.950(CFS)
Time of concentration =    6.85 min.
Rainfall intensity =     7.527(In/Hr)
Summary of stream data:

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


1      174.545      9.22               6.213
2        0.960      6.72               7.620
3        0.950      6.85               7.527
Qmax(1) =
          1.000 *    1.000 *   174.545) +
          0.815 *    1.000 *     0.960) +
          0.825 *    1.000 *     0.950) + =     176.113
Qmax(2) =
          1.000 *    0.729 *   174.545) +
          1.000 *    1.000 *     0.960) +
          1.000 *    0.981 *     0.950) + =     129.094
Qmax(3) =
          1.000 *    0.743 *   174.545) +
          0.988 *    1.000 *     0.960) +
          1.000 *    1.000 *     0.950) + =     131.545

Total of 3 streams to confluence:
Flow rates before confluence point:
     174.545       0.960       0.950
Maximum flow rates at confluence using above data:
      176.113      129.094      131.545
Area of streams before confluence:
       90.303        0.210        0.209
Results of confluence:
Total flow rate =    176.113(CFS)
Time of concentration =     9.223 min.
Effective stream area after confluence =     90.722(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       66.000 to Point/Station       81.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   661.000(Ft.)
Downstream point/station elevation =   659.680(Ft.)
Pipe length  =   132.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   176.113(CFS)
Nearest computed pipe diameter  =     54.00(In.)
Calculated individual pipe flow  =   176.113(CFS)
Normal flow depth in pipe =   39.89(In.)
Flow top width inside pipe =   47.45(In.)
```

```
Critical Depth =   46.20(In.)
Pipe flow velocity =     13.98(Ft/s)
Travel time through pipe =    0.16 min.
Time of concentration (TC) =     9.38 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       81.000 to Point/Station       81.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     90.722(Ac.)
Runoff from this stream =    176.113(CFS)
Time of concentration =    9.38 min.
Rainfall intensity =     6.146(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      516.000 to Point/Station      524.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  180.000(Ft.)
Highest elevation =  671.500(Ft.)
Lowest elevation =  666.000(Ft.)
Elevation difference =    5.500(Ft.) Slope =  3.056 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   3.06 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.88 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  90.000^.5)/(   3.056^(1/3)]=   5.88
Rainfall intensity (I) =      8.303(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      1.126(CFS)
Total initial stream area =        0.226(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      524.000 to Point/Station       81.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   661.500(Ft.)
Downstream point/station elevation =   659.680(Ft.)
Pipe length  =    18.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.126(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.126(CFS)
Normal flow depth in pipe =    3.46(In.)
Flow top width inside pipe =    5.93(In.)
Critical depth could not be calculated.
Pipe flow velocity =      9.61(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     5.91 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       81.000 to Point/Station       81.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.226(Ac.)
```

```
Runoff from this stream =      1.126(CFS)
Time of concentration =    5.91 min.
Rainfall intensity =     8.274(In/Hr)


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Process from Point/Station      521.000 to Point/Station      538.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Initial subarea total flow distance  =  179.000(Ft.)
Highest elevation =  671.500(Ft.)
Lowest elevation =  665.700(Ft.)
Elevation difference =    5.800(Ft.) Slope =  3.240 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   3.24 %, in a development type of
 10.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.77 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6000)*(  90.000^.5)/(   3.240^(1/3)]=   5.77
Rainfall intensity (I) =      8.408(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.600
Subarea runoff =      1.019(CFS)
Total initial stream area =        0.202(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      538.000 to Point/Station       81.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   661.000(Ft.)
Downstream point/station elevation =   659.680(Ft.)
Pipe length  =    50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.019(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.019(CFS)
Normal flow depth in pipe =    3.84(In.)
Flow top width inside pipe =    8.90(In.)
Critical Depth =    5.56(In.)
Pipe flow velocity =      5.66(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =     5.92 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       81.000 to Point/Station       81.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.202(Ac.)
Runoff from this stream =      1.019(CFS)
Time of concentration =    5.92 min.
Rainfall intensity =     8.272(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       94.000 to Point/Station       94.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
```

```
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      3.353(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  24.00 min.  Rain intensity =       3.35(In/Hr)
Total area =       12.670(Ac.)  Total runoff =    13.320(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       94.000 to Point/Station       81.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   686.500(Ft.)
Downstream point/station elevation =   655.770(Ft.)
Pipe length  =    73.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.320(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =    13.320(CFS)
Normal flow depth in pipe =    6.53(In.)
Flow top width inside pipe =   11.95(In.)
Critical depth could not be calculated.
Pipe flow velocity =     30.47(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    24.04 min.


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Process from Point/Station       81.000 to Point/Station       81.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 4
Stream flow area =     12.670(Ac.)
Runoff from this stream =     13.320(CFS)
Time of concentration =   24.04 min.
Rainfall intensity =     3.349(In/Hr)
Summary of stream data:

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


1      176.113      9.38               6.146
2        1.126      5.91               8.274
3        1.019      5.92               8.272
4       13.320     24.04               3.349
Qmax(1) =
          1.000 *    1.000 *   176.113) +
          0.743 *    1.000 *     1.126) +
          0.743 *    1.000 *     1.019) +
          1.000 *    0.390 *    13.320) + =     182.903
Qmax(2) =
          1.000 *    0.631 *   176.113) +
          1.000 *    1.000 *     1.126) +
          1.000 *    1.000 *     1.019) +
          1.000 *    0.246 *    13.320) + =     116.474
Qmax(3) =
          1.000 *    0.631 *   176.113) +
          1.000 *    1.000 *     1.126) +
          1.000 *    1.000 *     1.019) +
          1.000 *    0.246 *    13.320) + =     116.519
Qmax(4) =
          0.545 *    1.000 *   176.113) +
          0.405 *    1.000 *     1.126) +
          0.405 *    1.000 *     1.019) +
          1.000 *    1.000 *    13.320) + =     110.164

Total of 4 streams to confluence:
Flow rates before confluence point:
```

```
     176.113       1.126       1.019      13.320
Maximum flow rates at confluence using above data:
      182.903      116.474      116.519      110.164
Area of streams before confluence:
       90.722        0.226        0.202       12.670
Results of confluence:
Total flow rate =    182.903(CFS)
Time of concentration =     9.380 min.
Effective stream area after confluence =    103.820(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       81.000 to Point/Station       82.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   655.770(Ft.)
Downstream point/station elevation =   637.000(Ft.)
Pipe length  =   172.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   182.903(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =   182.903(CFS)
Normal flow depth in pipe =   25.03(In.)
Flow top width inside pipe =   33.14(In.)
Critical depth could not be calculated.
Pipe flow velocity =     34.85(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =     9.46 min.
End of computations, total study area =         103.820 (Ac.)
```

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2004 Version 7.4

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
       Rational Hydrology Study        Date: 02/18/13
----------------------------------------------------------------------
FINAL OUTFALL 10 - Las Posas Road: Node 1 TO 6
POST DEVELOPMENT AFTER DETENTION
100 Year Storm Event
File Name: D12052POSTOVERALL.RD3

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

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


Program License Serial Number 4012

----------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.500
24 hour precipitation(inches) =  6.000
P6/P24 =    58.3%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                     ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Initial subarea total flow distance  = 1012.000(Ft.)
Highest elevation = 1140.000(Ft.)
Lowest elevation =  900.000(Ft.)
Elevation difference =  240.000(Ft.) Slope = 23.715 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  23.72 %, in a development type of
 1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.32 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4100)*( 100.000^.5)/(  23.715^(1/3)]=   4.32
The initial area total distance of 1012.00 (Ft.) entered leaves a
remaining distance of  912.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   2.58 minutes
for a distance of 912.00 (Ft.) and a slope of 23.72 %
with an elevation difference of 216.28(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    2.585 Minutes
Tt=[(11.9*0.1727^3)/(216.28)]^.385=  2.58
Total initial area Ti =   4.32 minutes from Figure 3-3 formula plus
  2.58 minutes from the Figure 3-4 formula =   6.91 minutes
Rainfall intensity (I) =      7.486(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
Subarea runoff =     45.998(CFS)
Total initial stream area =       14.986(Ac.)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =    148.425(CFS)
Depth of flow =   1.083(Ft.), Average velocity =  12.664(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00             10.00
       2            100.00              0.00
       3            200.00             10.00
Manning's 'N' friction factor =   0.020
----------------------------------------------------------------
Sub-Channel flow  =    148.425(CFS)
  '     '       flow top width =     21.652(Ft.)
  '     '    velocity=   12.664(Ft/s)
  '     '       area =     11.720(Sq.Ft)
  '     '       Froude number =     3.033

Upstream point elevation =   900.000(Ft.)
Downstream point elevation =   721.000(Ft.)
Flow length =  2700.000(Ft.)
Travel time  =    3.55 min.
Time of concentration =   10.46 min.
Depth of flow =   1.083(Ft.)
Average velocity =  12.664(Ft/s)
Total irregular channel flow =   148.425(CFS)
Irregular channel normal depth above invert elev. =   1.083(Ft.)
Average velocity of channel(s) =  12.664(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                     ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Rainfall intensity =      5.728(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.410  CA =     43.782
Subarea runoff =    204.795(CFS) for     91.800(Ac.)
Total runoff =    250.793(CFS)        Total area =     106.786(Ac.)
Depth of flow =   1.318(Ft.), Average velocity =  14.439(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        4.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =    307.673(CFS)
Depth of flow =   1.722(Ft.), Average velocity =  10.375(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              5.00
       2            100.00              0.00
       3            100.00              5.00
Manning's 'N' friction factor =   0.023
----------------------------------------------------------------
Sub-Channel flow  =    307.673(CFS)
  '     '       flow top width =     34.441(Ft.)
  '     '    velocity=   10.375(Ft/s)
  '     '       area =     29.655(Sq.Ft)
  '     '       Froude number =     1.970

Upstream point elevation =   721.000(Ft.)
Downstream point elevation =   668.000(Ft.)
Flow length =  1575.000(Ft.)
Travel time  =    2.53 min.
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Time of concentration =   12.99 min.
Depth of flow =   1.722(Ft.)
Average velocity =  10.375(Ft/s)
Total irregular channel flow =   307.673(CFS)
Irregular channel normal depth above invert elev. =   1.722(Ft.)
Average velocity of channel(s) =  10.375(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Rainfall intensity =      4.981(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.410  CA =     73.172
Subarea runoff =    113.696(CFS) for     71.682(Ac.)
Total runoff =    364.490(CFS)        Total area =     178.468(Ac.)
Depth of flow =   1.835(Ft.), Average velocity =  10.824(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        4.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    178.468(Ac.)
Runoff from this stream =    364.490(CFS)
Time of concentration =   12.99 min.
Rainfall intensity =     4.981(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station       10.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Initial subarea total flow distance  = 1909.000(Ft.)
Highest elevation = 1302.000(Ft.)
Lowest elevation =  820.000(Ft.)
Elevation difference =  482.000(Ft.) Slope = 25.249 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  25.25 %, in a development type of
 1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.23 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4100)*( 100.000^.5)/(  25.249^(1/3)]=   4.23
The initial area total distance of 1909.00 (Ft.) entered leaves a
remaining distance of 1809.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   4.28 minutes
for a distance of 1809.00 (Ft.) and a slope of 25.25 %
with an elevation difference of 456.75(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    4.275 Minutes
Tt=[(11.9*0.3426^3)/(456.75)]^.385=  4.28
Total initial area Ti =   4.23 minutes from Figure 3-3 formula plus
  4.28 minutes from the Figure 3-4 formula =   8.51 minutes
Rainfall intensity (I) =      6.544(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
Subarea runoff =     60.081(CFS)
Total initial stream area =       22.391(Ac.)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station        4.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =    194.618(CFS)
Depth of flow =   0.918(Ft.), Average velocity =  11.540(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              5.00
       2            100.00              0.00
       3            200.00              5.00
Manning's 'N' friction factor =   0.020
----------------------------------------------------------------
Sub-Channel flow  =    194.618(CFS)
  '     '       flow top width =     36.731(Ft.)
  '     '    velocity=   11.540(Ft/s)
  '     '       area =     16.864(Sq.Ft)
  '     '       Froude number =     3.001

Upstream point elevation =   820.000(Ft.)
Downstream point elevation =   668.000(Ft.)
Flow length =  2228.000(Ft.)
Travel time  =    3.22 min.
Time of concentration =   11.73 min.
Depth of flow =   0.918(Ft.)
Average velocity =  11.540(Ft/s)
Total irregular channel flow =   194.618(CFS)
Irregular channel normal depth above invert elev. =   0.918(Ft.)
Average velocity of channel(s) =  11.540(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                     ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Rainfall intensity =      5.321(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.410  CA =     61.845
Subarea runoff =    269.022(CFS) for    128.450(Ac.)
Total runoff =    329.102(CFS)        Total area =     150.841(Ac.)
Depth of flow =   1.118(Ft.), Average velocity =  13.160(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        4.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =    150.841(Ac.)
Runoff from this stream =    329.102(CFS)
Time of concentration =   11.73 min.
Rainfall intensity =     5.321(In/Hr)
Summary of stream data:

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


1      364.490     12.99               4.981
2      329.102     11.73               5.321
Qmax(1) =
          1.000 *    1.000 *   364.490) +
          0.936 *    1.000 *   329.102) + =     672.557
Qmax(2) =
          1.000 *    0.903 *   364.490) +
          1.000 *    1.000 *   329.102) + =     658.114
```

```
Total of 2 streams to confluence:
Flow rates before confluence point:
     364.490     329.102
Maximum flow rates at confluence using above data:
      672.557      658.114
Area of streams before confluence:
      178.468      150.841
Results of confluence:
Total flow rate =    672.557(CFS)
Time of concentration =    12.991 min.
Effective stream area after confluence =    329.309(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        4.200
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Depth of flow =   3.950(Ft.), Average velocity =   6.898(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00             16.00
       2            100.00              0.00
       3            200.00             16.00
Manning's 'N' friction factor =   0.045
----------------------------------------------------------------
Sub-Channel flow  =    672.556(CFS)
  '     '       flow top width =     49.371(Ft.)
  '     '    velocity=    6.898(Ft/s)
  '     '       area =     97.500(Sq.Ft)
  '     '       Froude number =     0.865

Upstream point elevation =   668.000(Ft.)
Downstream point elevation =   656.000(Ft.)
Flow length =   670.000(Ft.)
Travel time  =    1.62 min.
Time of concentration =   14.61 min.
Depth of flow =   3.950(Ft.)
Average velocity =   6.898(Ft/s)
Total irregular channel flow =   672.557(CFS)
Irregular channel normal depth above invert elev. =   3.950(Ft.)
Average velocity of channel(s) =   6.898(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.200 to Point/Station        4.200
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    329.309(Ac.)
Runoff from this stream =    672.557(CFS)
Time of concentration =   14.61 min.
Rainfall intensity =     4.618(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.100 to Point/Station        4.200
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance  =  887.000(Ft.)
Highest elevation =  835.000(Ft.)
Lowest elevation =  656.000(Ft.)
Elevation difference =  179.000(Ft.) Slope = 20.180 %
Top of Initial Area Slope adjusted by User to 30.000 %
```

```
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  30.00 %, in a development type of
 Permanent Open Space
In Accordance With Table 3-2
Initial Area Time of Concentration =   6.90 minutes
 (for slope value of  10.00 %)
Rainfall intensity (I) =      7.492(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff =     48.850(CFS)
Total initial stream area =       18.630(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.200 to Point/Station        4.200
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     18.630(Ac.)
Runoff from this stream =     48.850(CFS)
Time of concentration =    6.90 min.
Rainfall intensity =     7.492(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      511.000 to Point/Station        4.200
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      6.312(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   9.00 min.  Rain intensity =       6.31(In/Hr)
Total area =        0.944(Ac.)  Total runoff =     3.650(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.200 to Point/Station        4.200
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.944(Ac.)
Runoff from this stream =      3.650(CFS)
Time of concentration =    9.00 min.
Rainfall intensity =     6.312(In/Hr)
Summary of stream data:

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


1      672.557     14.61               4.618
2       48.850      6.90               7.492
3        3.650      9.00               6.312
Qmax(1) =
          1.000 *    1.000 *   672.557) +
          0.616 *    1.000 *    48.850) +
          0.732 *    1.000 *     3.650) + =     705.338
Qmax(2) =
          1.000 *    0.472 *   672.557) +
          1.000 *    1.000 *    48.850) +
          1.000 *    0.767 *     3.650) + =     369.286
Qmax(3) =
          1.000 *    0.616 *   672.557) +
          0.843 *    1.000 *    48.850) +
          1.000 *    1.000 *     3.650) + =     459.117
```

```
Total of 3 streams to confluence:
Flow rates before confluence point:
     672.557      48.850       3.650
Maximum flow rates at confluence using above data:
      705.338      369.286      459.117
Area of streams before confluence:
      329.309       18.630        0.944
Results of confluence:
Total flow rate =    705.338(CFS)
Time of concentration =    14.610 min.
Effective stream area after confluence =    348.883(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.200 to Point/Station        4.300
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Depth of flow =   4.839(Ft.), Average velocity =   4.819(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00             16.00
       2            100.00              0.00
       3            200.00             16.00
Manning's 'N' friction factor =   0.045
----------------------------------------------------------------
Sub-Channel flow  =    705.338(CFS)
  '     '       flow top width =     60.492(Ft.)
  '     '    velocity=    4.819(Ft/s)
  '     '       area =    146.372(Sq.Ft)
  '     '       Froude number =     0.546

Upstream point elevation =   656.000(Ft.)
Downstream point elevation =   654.000(Ft.)
Flow length =   300.000(Ft.)
Travel time  =    1.04 min.
Time of concentration =   15.65 min.
Depth of flow =   4.839(Ft.)
Average velocity =   4.819(Ft/s)
Total irregular channel flow =   705.338(CFS)
Irregular channel normal depth above invert elev. =   4.839(Ft.)
Average velocity of channel(s) =   4.819(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.300 to Point/Station        4.300
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    348.883(Ac.)
Runoff from this stream =    705.338(CFS)
Time of concentration =   15.65 min.
Rainfall intensity =     4.418(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      523.000 to Point/Station        4.300
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      8.198(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   6.00 min.  Rain intensity =       8.20(In/Hr)
Total area =        0.860(Ac.)  Total runoff =     4.100(CFS)
```

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Process from Point/Station       4.300 to Point/Station       4.300
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.860(Ac.)
Runoff from this stream =      4.100(CFS)
Time of concentration =    6.00 min.
Rainfall intensity =     8.198(In/Hr)
Summary of stream data:

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


1      705.338     15.65               4.418
2        4.100      6.00               8.198
Qmax(1) =
          1.000 *    1.000 *   705.338) +
          0.539 *    1.000 *     4.100) + =     707.547
Qmax(2) =
          1.000 *    0.383 *   705.338) +
          1.000 *    1.000 *     4.100) + =     274.561

Total of 2 streams to confluence:
Flow rates before confluence point:
     705.338       4.100
Maximum flow rates at confluence using above data:
      707.547      274.561
Area of streams before confluence:
      348.883        0.860
Results of confluence:
Total flow rate =    707.547(CFS)
Time of concentration =    15.647 min.
Effective stream area after confluence =    349.743(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.300 to Point/Station      430.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   647.000(Ft.)
Downstream point/station elevation =   641.300(Ft.)
Pipe length  =    83.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   707.547(CFS)
Nearest computed pipe diameter  =     63.00(In.)
Calculated individual pipe flow  =   707.547(CFS)
Normal flow depth in pipe =   47.16(In.)
Flow top width inside pipe =   54.67(In.)
Critical depth could not be calculated.
Pipe flow velocity =     40.69(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    15.68 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      430.000 to Point/Station      430.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    349.743(Ac.)
Runoff from this stream =    707.547(CFS)
Time of concentration =   15.68 min.
Rainfall intensity =     4.412(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      434.000 to Point/Station      430.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
```

```
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      8.198(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   6.00 min.  Rain intensity =       8.20(In/Hr)
Total area =        1.850(Ac.)  Total runoff =     8.780(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      430.000 to Point/Station      430.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.850(Ac.)
Runoff from this stream =      8.780(CFS)
Time of concentration =    6.00 min.
Rainfall intensity =     8.198(In/Hr)
Summary of stream data:

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


1      707.547     15.68               4.412
2        8.780      6.00               8.198
Qmax(1) =
           1.000 *    1.000 *   707.547) +
           0.538 *    1.000 *     8.780) + =     712.272
Qmax(2) =
           1.000 *    0.383 *   707.547) +
           1.000 *    1.000 *     8.780) + =     279.500

Total of 2 streams to confluence:
Flow rates before confluence point:
     707.547       8.780
Maximum flow rates at confluence using above data:
      712.272      279.500
Area of streams before confluence:
      349.743        1.850
Results of confluence:
Total flow rate =    712.272(CFS)
Time of concentration =    15.681 min.
Effective stream area after confluence =    351.593(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      430.000 to Point/Station        5.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Depth of flow =   0.355(Ft.), Average velocity =   3.337(Ft/s)
        ******* Irregular Channel Data ***********
-------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00             25.00
        2             60.00              0.00
        3            660.00              0.00
        4            720.00             20.00
Manning's 'N' friction factor =   0.045
-------------------------------------------------------------------
Sub-Channel flow  =    712.278(CFS)
  '     '       flow top width =    601.918(Ft.)
  '     '    velocity=    3.337(Ft/s)
  '     '       area =    213.424(Sq.Ft)
  '     '       Froude number =     0.988

Upstream point elevation =   641.300(Ft.)
Downstream point elevation =   631.000(Ft.)
Flow length =   253.000(Ft.)
```

```
Travel time  =    1.26 min.
Time of concentration =   16.94 min.
Depth of flow =   0.355(Ft.)
Average velocity =   3.337(Ft/s)
Total irregular channel flow =   712.272(CFS)
Irregular channel normal depth above invert elev. =   0.355(Ft.)
Average velocity of channel(s) =   3.337(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        5.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    351.593(Ac.)
Runoff from this stream =    712.272(CFS)
Time of concentration =   16.94 min.
Rainfall intensity =     4.197(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       82.000 to Point/Station        5.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      6.312(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   9.00 min.  Rain intensity =       6.31(In/Hr)
Total area =      103.820(Ac.)  Total runoff =   182.900(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        5.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =    103.820(Ac.)
Runoff from this stream =    182.900(CFS)
Time of concentration =    9.00 min.
Rainfall intensity =     6.312(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      648.000 to Point/Station        5.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      5.897(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  10.00 min.  Rain intensity =       5.90(In/Hr)
Total area =       15.310(Ac.)  Total runoff =     7.160(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        5.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =     15.310(Ac.)
```

```
Runoff from this stream =      7.160(CFS)
Time of concentration =   10.00 min.
Rainfall intensity =     5.897(In/Hr)
Summary of stream data:

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


1      712.272     16.94               4.197
2      182.900      9.00               6.312
3        7.160     10.00               5.897
Qmax(1) =
          1.000 *    1.000 *   712.272) +
          0.665 *    1.000 *   182.900) +
          0.712 *    1.000 *     7.160) + =     838.978
Qmax(2) =
          1.000 *    0.531 *   712.272) +
          1.000 *    1.000 *   182.900) +
          1.000 *    0.900 *     7.160) + =     567.655
Qmax(3) =
          1.000 *    0.590 *   712.272) +
          0.934 *    1.000 *   182.900) +
          1.000 *    1.000 *     7.160) + =     598.389

Total of 3 streams to confluence:
Flow rates before confluence point:
     712.272     182.900       7.160
Maximum flow rates at confluence using above data:
      838.978      567.655      598.389
Area of streams before confluence:
      351.593      103.820       15.310
Results of confluence:
Total flow rate =    838.978(CFS)
Time of concentration =    16.945 min.
Effective stream area after confluence =    470.723(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station      543.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Depth of flow =   0.405(Ft.), Average velocity =   3.444(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00             25.00
       2             60.00              0.00
       3            660.00              0.00
       4            720.00             20.00
Manning's 'N' friction factor =   0.045
----------------------------------------------------------------
Sub-Channel flow  =    838.982(CFS)
  '     '       flow top width =    602.189(Ft.)
  '     '    velocity=    3.444(Ft/s)
  '     '       area =    243.614(Sq.Ft)
  '     '       Froude number =     0.954

Upstream point elevation =   631.000(Ft.)
Downstream point elevation =   627.000(Ft.)
Flow length =   110.000(Ft.)
Travel time  =    0.53 min.
Time of concentration =   17.48 min.
Depth of flow =   0.405(Ft.)
Average velocity =   3.444(Ft/s)
Total irregular channel flow =   838.978(CFS)
Irregular channel normal depth above invert elev. =   0.405(Ft.)
Average velocity of channel(s) =   3.444(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      543.000 to Point/Station      543.000
```

```
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    470.723(Ac.)
Runoff from this stream =    838.978(CFS)
Time of concentration =   17.48 min.
Rainfall intensity =     4.114(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      543.000 to Point/Station      543.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
____________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      7.423(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   7.00 min.  Rain intensity =       7.42(In/Hr)
Total area =        5.790(Ac.)  Total runoff =    20.100(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      543.000 to Point/Station      543.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      5.790(Ac.)
Runoff from this stream =     20.100(CFS)
Time of concentration =    7.00 min.
Rainfall intensity =     7.423(In/Hr)
Summary of stream data:

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


1      838.978     17.48               4.114
2       20.100      7.00               7.423
Qmax(1) =
          1.000 *    1.000 *   838.978) +
          0.554 *    1.000 *    20.100) + =     850.118
Qmax(2) =
          1.000 *    0.401 *   838.978) +
          1.000 *    1.000 *    20.100) + =     356.128

Total of 2 streams to confluence:
Flow rates before confluence point:
     838.978      20.100
Maximum flow rates at confluence using above data:
      850.118      356.128
Area of streams before confluence:
      470.723        5.790
Results of confluence:
Total flow rate =    850.118(CFS)
Time of concentration =    17.477 min.
Effective stream area after confluence =    476.513(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      543.000 to Point/Station        5.100
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
____________________________________________________________________
Depth of flow =   5.122(Ft.), Average velocity =   9.607(Ft/s)
        ******* Irregular Channel Data ***********
-------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
```

```
        1              0.00             24.00
        2             85.00              0.00
        3            226.00             44.00
Manning's 'N' friction factor =   0.045
----------------------------------------------------------------
Sub-Channel flow  =    850.118(CFS)
  '     '       flow top width =     34.553(Ft.)
  '     '    velocity=    9.607(Ft/s)
  '     '       area =     88.488(Sq.Ft)
  '     '       Froude number =     1.058

Upstream point elevation =   627.000(Ft.)
Downstream point elevation =   604.000(Ft.)
Flow length =   900.000(Ft.)
Travel time  =    1.56 min.
Time of concentration =   19.04 min.
Depth of flow =   5.122(Ft.)
Average velocity =   9.607(Ft/s)
Total irregular channel flow =   850.118(CFS)
Irregular channel normal depth above invert elev. =   5.122(Ft.)
Average velocity of channel(s) =   9.607(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.100 to Point/Station        5.100
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    476.513(Ac.)
Runoff from this stream =    850.118(CFS)
Time of concentration =   19.04 min.
Rainfall intensity =     3.893(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      243.000 to Point/Station        5.100
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      6.312(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   9.00 min.  Rain intensity =       6.31(In/Hr)
Total area =        8.280(Ac.)  Total runoff =    24.200(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.100 to Point/Station        5.100
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      8.280(Ac.)
Runoff from this stream =     24.200(CFS)
Time of concentration =    9.00 min.
Rainfall intensity =     6.312(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      552.000 to Point/Station        5.100
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
```

```
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      7.423(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   7.00 min.  Rain intensity =       7.42(In/Hr)
Total area =        4.450(Ac.)  Total runoff =    13.800(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.100 to Point/Station        5.100
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      4.450(Ac.)
Runoff from this stream =     13.800(CFS)
Time of concentration =    7.00 min.
Rainfall intensity =     7.423(In/Hr)
Summary of stream data:

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


1      850.118     19.04               3.893
2       24.200      9.00               6.312
3       13.800      7.00               7.423
Qmax(1) =
          1.000 *    1.000 *   850.118) +
          0.617 *    1.000 *    24.200) +
          0.524 *    1.000 *    13.800) + =     872.281
Qmax(2) =
          1.000 *    0.473 *   850.118) +
          1.000 *    1.000 *    24.200) +
          0.850 *    1.000 *    13.800) + =     437.806
Qmax(3) =
          1.000 *    0.368 *   850.118) +
          1.000 *    0.778 *    24.200) +
          1.000 *    1.000 *    13.800) + =     345.189

Total of 3 streams to confluence:
Flow rates before confluence point:
     850.118      24.200      13.800
Maximum flow rates at confluence using above data:
      872.281      437.806      345.189
Area of streams before confluence:
      476.513        8.280        4.450
Results of confluence:
Total flow rate =    872.281(CFS)
Time of concentration =    19.039 min.
Effective stream area after confluence =    489.243(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.100 to Point/Station        5.200
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Depth of flow =   4.968(Ft.), Average velocity =  10.478(Ft/s)
       ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00             24.00
       2             85.00              0.00
       3            226.00             44.00
Manning's 'N' friction factor =   0.045
-----------------------------------------------------------------
Sub-Channel flow  =    872.282(CFS)
  '     '       flow top width =     33.514(Ft.)
  '     '    velocity=   10.478(Ft/s)
  '     '       area =     83.248(Sq.Ft)
  '     '       Froude number =     1.172

Upstream point elevation =   604.000(Ft.)
```

```
Downstream point elevation =   592.000(Ft.)
Flow length =   379.000(Ft.)
Travel time  =    0.60 min.
Time of concentration =   19.64 min.
Depth of flow =   4.968(Ft.)
Average velocity =  10.478(Ft/s)
Total irregular channel flow =   872.281(CFS)
Irregular channel normal depth above invert elev. =   4.968(Ft.)
Average velocity of channel(s) =  10.478(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.200 to Point/Station        5.200
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    489.243(Ac.)
Runoff from this stream =    872.281(CFS)
Time of concentration =   19.64 min.
Rainfall intensity =     3.815(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      559.000 to Point/Station        5.200
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(10.9 DU/A or Less      )
Impervious value, Ai = 0.450
Sub-Area C Value = 0.600
Rainfall intensity (I) =      7.423(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   7.00 min.  Rain intensity =       7.42(In/Hr)
Total area =        4.620(Ac.)  Total runoff =    13.000(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.200 to Point/Station        5.200
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      4.620(Ac.)
Runoff from this stream =     13.000(CFS)
Time of concentration =    7.00 min.
Rainfall intensity =     7.423(In/Hr)
Summary of stream data:

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


1      872.281     19.64               3.815
2       13.000      7.00               7.423
Qmax(1) =
          1.000 *    1.000 *   872.281) +
          0.514 *    1.000 *    13.000) + =     878.964
Qmax(2) =
          1.000 *    0.356 *   872.281) +
          1.000 *    1.000 *    13.000) + =     323.872

Total of 2 streams to confluence:
Flow rates before confluence point:
     872.281      13.000
Maximum flow rates at confluence using above data:
      878.964      323.872
Area of streams before confluence:
      489.243        4.620
Results of confluence:
Total flow rate =    878.964(CFS)
```

```
Time of concentration =    19.641 min.
Effective stream area after confluence =    493.863(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.200 to Point/Station        6.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =    899.153(CFS)
Depth of flow =   5.591(Ft.), Average velocity =   8.756(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00             24.00
       2             85.00              0.00
       3            226.00             44.00
Manning's 'N' friction factor =   0.045
----------------------------------------------------------------
Sub-Channel flow  =    899.153(CFS)
  '     '       flow top width =     37.718(Ft.)
  '     '    velocity=    8.756(Ft/s)
  '     '       area =    105.439(Sq.Ft)
  '     '       Froude number =     0.923

Upstream point elevation =   592.000(Ft.)
Downstream point elevation =   575.000(Ft.)
Flow length =   900.000(Ft.)
Travel time  =    1.71 min.
Time of concentration =   21.35 min.
Depth of flow =   5.591(Ft.)
Average velocity =   8.756(Ft/s)
Total irregular channel flow =   899.153(CFS)
Irregular channel normal depth above invert elev. =   5.591(Ft.)
Average velocity of channel(s) =   8.756(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                    ]
(2.0 DU/A or Less       )
Impervious value, Ai = 0.200
Sub-Area C Value = 0.460
Rainfall intensity =      3.615(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.463  CA =    267.626
Subarea runoff =     40.386(CFS) for     83.770(Ac.)
Total runoff =    919.350(CFS)        Total area =     577.633(Ac.)
Depth of flow =   5.280(Ft.), Average velocity =   8.859(Ft/s)
End of computations, total study area =         577.633 (Ac.)
```

APPENDIX 5

SWMM CALCULATION

## I. MODEL SETUP

### Pre-development Model Setup

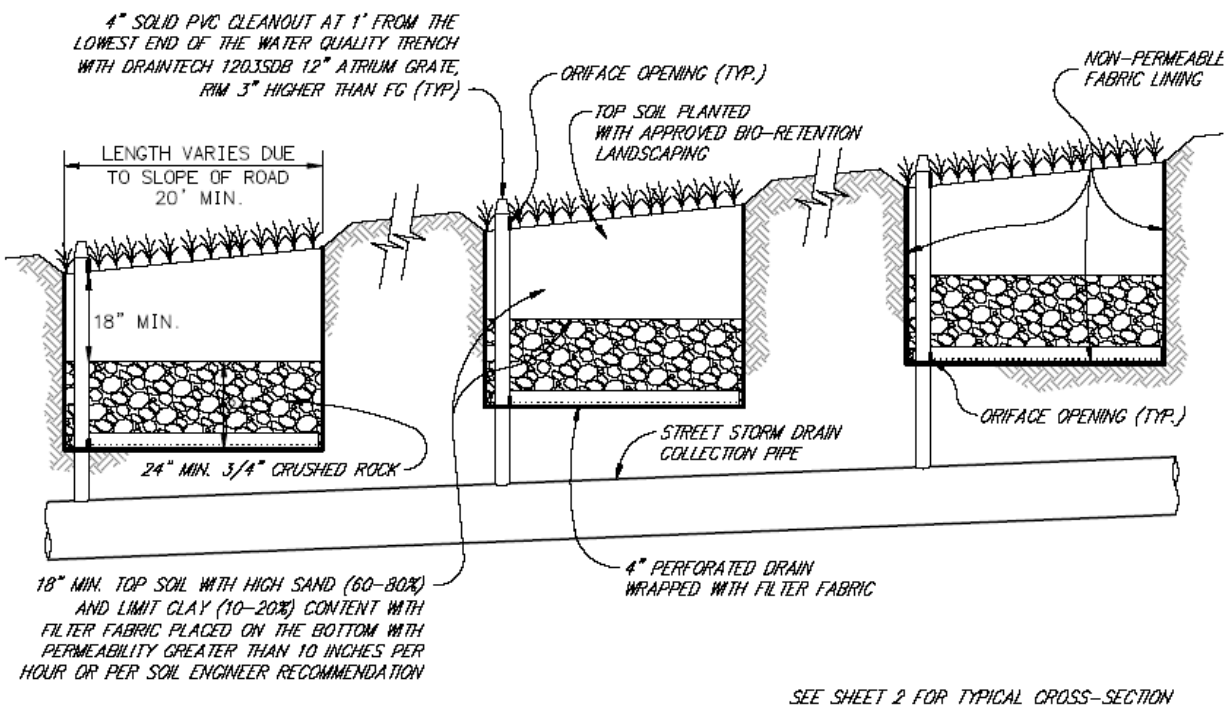
The SWMM model for the pre-development site is depicted in figure 3 and 4 on the next page. It consists of a rain gage "Oceanside" that provides continuous precipitation input to a sub-catchment with its outfall based on the contributing basins.

Imperviousness

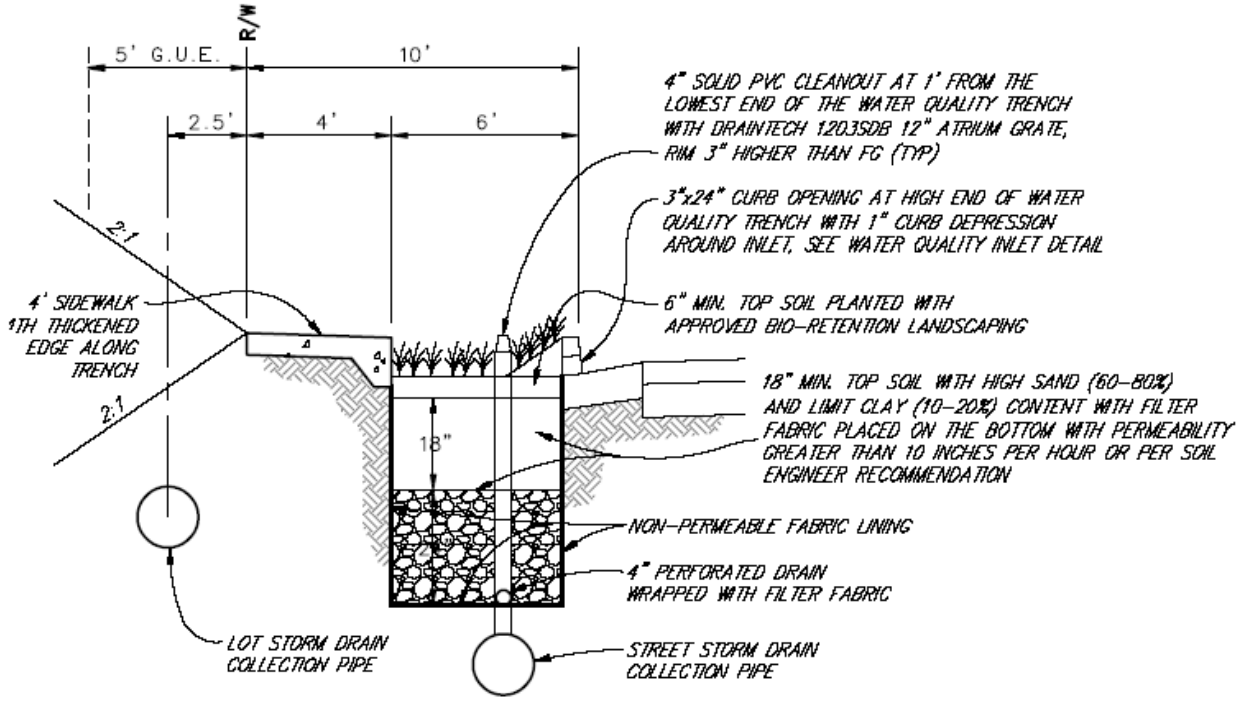
The imperviousness parameter in SWMM is the effective or directly connected impervious area, which is typically less than the total imperviousness and is assume a 60% of imperviousness for the pads and 100% impervious for the streets. The effective impervious area is the impervious area that drains directly to the Stormwater conveyance system. The pre-development condition is undeveloped. For the purpose of this preliminary study, the site is assumed to have NO impervious surface in the existing condition.

### Post-Development Model Setup

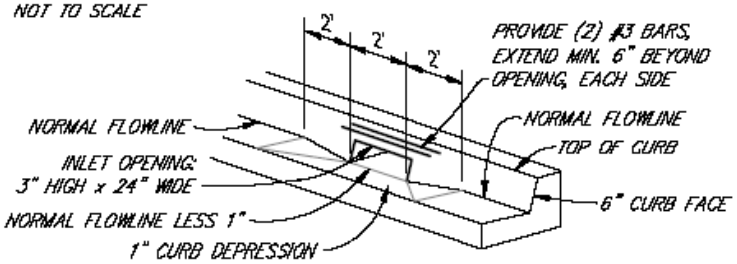
Figure 3 and 4 illustrate each contributing basin discharging its overland flow directly into the bio-retention system. Each bio-retention layer section has a similar configuration as seen as in the detail drawing below (this is a typical condition that applies to almost all of the lots). There is no actual elevation entered in the program. The bottom elevation of the bio-retention surface storage is assumed at 0 ft. The pipe outlet between the junction node and the final outfall nodes has minus elevations to avoid a backwater effect.



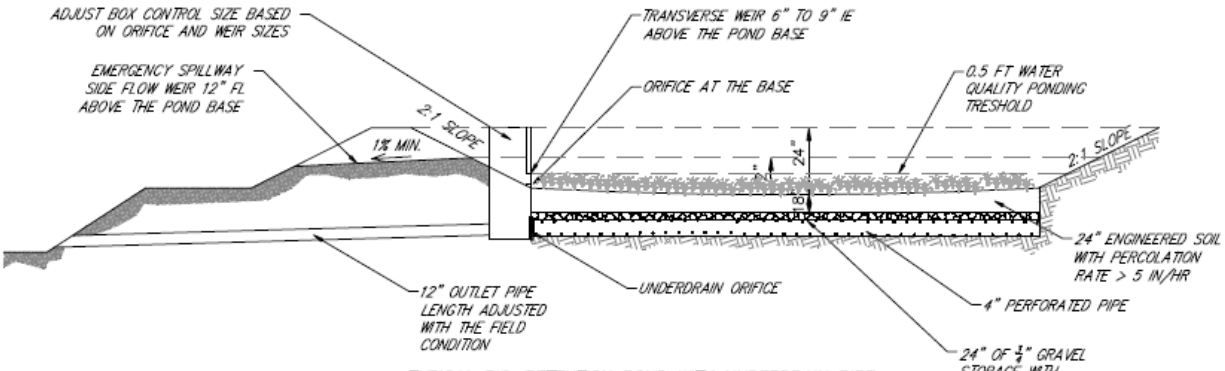

WATER QUALITY TRENCH TYPICAL SECTION
NOT TO SCALE




WATER QUALITY TRENCH CROSS-SECTION
NOT TO SCALE




WATER QUALITY INLET DETAIL
NOT TO SCALE




TYPICAL BIO-RETENTION POND WITH UNDERDRAIN PIPE
NOT TO SCALE

Figure-2. Typical Bio-retention Section

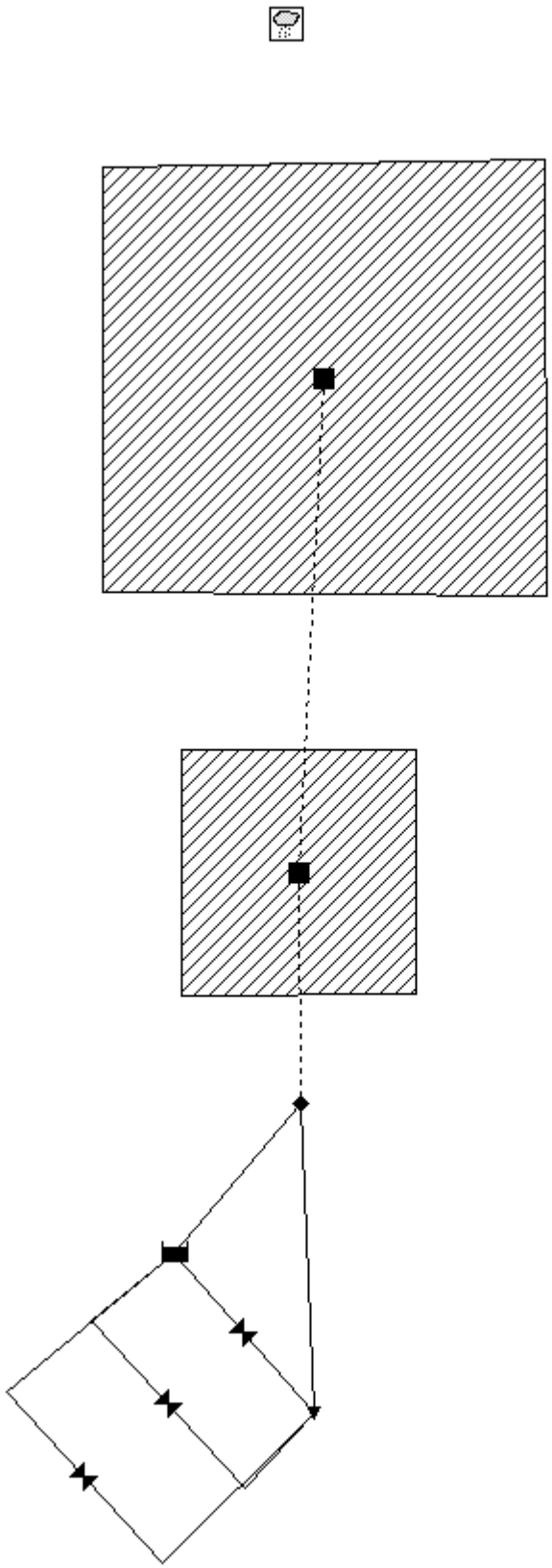


Figure-3.  Mitigated Post-Development of SWMM continuous model

## II. SYSTEM REPRESENTATION

SWMM is a distributed model, which means that a study area can be subdivided into any number of irregular sub-catchments to best capture the effect that spatial variability in topography, drainage pathways, land cover, and soil characteristics have on runoff generation. For modeling of Hydromodification calculations, there are four main system representations: Rain gage, Sub-catchment (contributing basin or LID area), Nodes and Links.

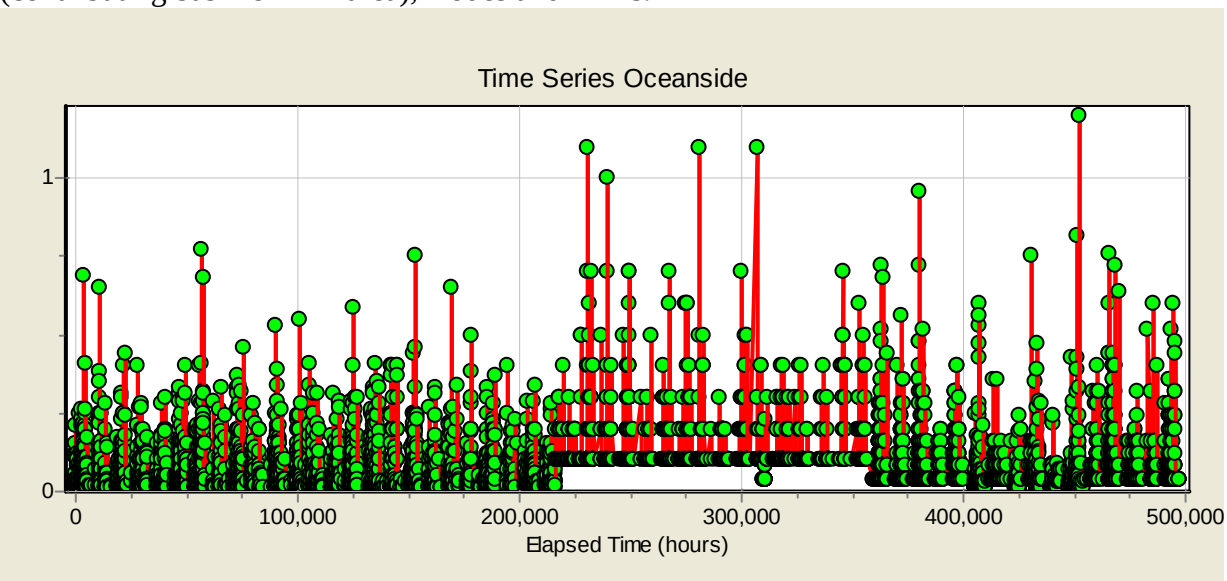



Fig. 4 – Time series rain data, which corresponds to runoff estimates for each of the 508,080 time steps (each date and hour) of the 58-year simulation period. (Inches/hour vs. elapsed time)

### Rain Gage

The properties of a rain gage describe the source and format of the precipitation data that are applied to the study area. In this project, the rainfall data consist of a long-term rainfall record stored in a user-defined Time Series labeled as "Oceanside" rain gage station. The Oceanside rain station was chosen due to its data quality and its location to the project site.

The rain gage supplies precipitation data for one or more sub-catchment areas in a study region taken from the Project Clean Water website (www.projectcleanwater.org). This data file contains rainfall intensity, hourly-recorded time interval, and the dates of recorded precipitation each hour. The Oceanside rain data has approximately 58 years of hourly precipitation data from 8/28/1951 to 5/23/2008 and generates 58 years of hourly runoff estimates, which corresponds to runoff estimates for each of the 508,080 time steps (each date and hour) of the 58 year simulation period. See figure 1 for hourly precipitation intensity graph for 58 years in inches.

### Sub-catchment (contributing basin or LID area)

A basin is modeled using a sub-catchment object, which contains some of the following properties:

*Rain Gage*

The rate of stormwater runoff and volume depends directly on the precipitation magnitude and its spatial and temporal distribution over the catchment. Each sub-catchment in SWMM is linked to a rain gage object that describes the format and source of the rainfall input for the sub-catchment.

*Area*
This area is bounded by the sub-catchment boundary. Its value is determined directly from maps or field surveys of the site or by using SWMM's Auto-length tool when the sub-catchment is drawn to scale on SWMM's study area map. This Project is divided into several sub-catchments based on its outfall. Bio-retention strips are calculated based on the average areas as follows:

0.066 acres
0.085 acres
0.108 acres
0.175 acres

Bio-retention ponds:

0.61 acres (Pond B)
0.285 acres (Pond C)
11.06 acres (Pond D)
1.26 acres (Pond E)
1.55 acres (Pond F)
13.3 acres (Pond G)
0.67 acres (Pond H)
0.48 acres (Pond J)
2.22 acres (Pond K)

*Width*
Width can be defined as the sub-catchment's area divided by the length of the longest overland flow path that water can travel. When there are several such paths, one would use an average of their lengths to compute a width. If overland flow is visualized as running down –slope off an idealized, rectangular catchment, then the width of the sub-catchment is the physical width of overland flow. In natural areas, true overland flow can only occur for distances of about 500 feet before it begins to consolidate into a small stream flow. In post-development, the true overland flow can be very short before it is collected into open channels. A maximum overland flow of 500 ft is appropriate for a non-urban catchment, while the typical overland flow length is appropriate for non-urban catchments; the typical overland flow length is the length from the back of a representative lot to the center of the street for urban catchments. If the overland flow length varies greatly within a sub-catchment, then an area-weighted average should be used.

*Slope*
This is the slope of the land surface over which runoff flows and is the same for both the pervious and impervious surfaces. It is the slope of what one considers being the overland flow path or its area-weighted average if there are several paths in the sub-catchment.

*Imperviousness*
This is the percentage of sub-catchment area covered by impervious surfaces such as sidewalks and roadways or whatever surfaces that rainfall cannot infiltrate. 60% of imperviousness was used for pad areas.

*Roughness Coefficient*
The roughness coefficient reflects the amount of resistance that overland flow encounters as it runs off of the sub-catchment surface.

*Infiltration Model*
The pre-development condition is primarily barren land with dirt roads. Some areas have been developed with pavement. Based on the hydrology manual this area was grouped as soil type D. In the model, clay soil was used for the post-development condition and sandy clay loam was used as the pre-development condition for a very conservative approach. Infiltration of rainfall from the pervious area of a sub-catchment into the unsaturated upper soil zone can be described using three different infiltration models: Horton, Green-Ampt, and Curve Number. There is no general agreement on which method of these three is the best.
The Green-Ampt method was chosen to calculate the infiltration of the pervious areas based on the availability of data for this project. It is invoked when editing the infiltration property of a sub-catchment.

Table 1 – Soil Infiltration Parameter

| **Soil Texture Class** | **K** | **Ψ** | **ϕ** | **FC** | **WP** |
|---|---|---|---|---|---|
| Sand | 4.74 | 1.93 | 0.437 | 0.062 | 0.024 |
| Loamy Sand | 1.18 | 2.40 | 0.437 | 0.105 | 0.047 |
| Sandy Loam | 0.43 | 4.33 | 0.453 | 0.190 | 0.085 |
| Loam | 0.13 | 3.50 | 0.463 | 0.232 | 0.116 |
| Silt Loam | 0.26 | 6.69 | 0.501 | 0.284 | 0.135 |
| Sandy Clay Loam | 0.06 | 8.66 | 0.398 | 0.244 | 0.136 |
| Clay Loam | 0.04 | 8.27 | 0.464 | 0.310 | 0.187 |
| Silty Clay Loam | 0.04 | 10.63 | 0.471 | 0.342 | 0.210 |
| Sandy Clay | 0.02 | 9.45 | 0.430 | 0.321 | 0.221 |
| Silty Clay | 0.02 | 11.42 | 0.479 | 0.371 | 0.251 |
| Clay | 0.01 | 12.60 | 0.475 | 0.378 | 0.265 |

**K** = hydraulic conductivity, in/hr
**Ψ** = suction head, in.
**ϕ** = porosity, fraction
**FC** = field capacity, fraction
**WP**= wilting point, fraction

Source: Rawls, W.J. et al., (1983). *J. Hyd. Engr*., 109:1316.

*LID controls*
Utilizing LID controls within a SWMM project is a two step process that:

- Creates a set of scale-independent LID controls that can be deployed throughout the study area,
- Assign any desired mix and sizing of these controls to designated sub-catchments.

The LID control type that was selected was a bio-retention cell that contains vegetation grown in an engineered soil mixture placed above a gravel drainage bed. Bio-retention provides storage, infiltration (depending on the soil type) and evaporation of both direct rainfall and runoff captured from surrounding areas. For this project, we do not allow infiltration to the existing/filled soil.

## III. CONTINUOUS SIMULATION OPTIONS

**Kinematic Wave Routing Model**

This routing method solves the continuity equation along with a simplified form of the momentum equation in each conduit. The latter requires that the slope of the water surface be equal to the slope of the conduit.

The maximum flow that can be conveyed through a conduit is the full normal flow value. Any flow in excess of this entering the inlet node is either lost from the system or can pond atop the inlet node and be re-introduced into the conduit as capacity becomes available.

Kinematic wave routing allows flow and area to vary both spatially and temporally within a conduit. This can result in attenuated and delayed outflow hydrographs as inflow is routed through the channel. However this form of routing cannot account for backwater effects, entrance/exit losses, flow reversal, or pressurized flow, and is also restricted to dendritic network layouts. It can usually maintain numerical stability with moderately large time steps, on the order of 1 to 5 minutes. Since the aforementioned effects are not expected to be significant, this alternative can be an accurate and efficient routing method, especially for long-term simulations.

**Simulation Dates**

These dates determine the starting and ending dates/times of a simulation and are chosen based on the rain data availability.

Start analysis on 01/03/1951
Start Reporting on 01/03/1951
End Analysis on 05/23/2008

**Time Steps**

The Time Steps establish the length of the time steps used for runoff computation, routing computation and results reporting. Time steps are specified in days and hours: minutes: seconds except for flow routing which is entered as decimal seconds.

**Climatology**

-*Evaporation Data*

The available evaporation data for San Diego County that is similar to this project condition is taken from the Chula Vista Evaporation Station Western Regional Climate Center.

Table 2 – Chula Vista Monthly Evaporation data (in/day)

| January | February | March | April | May | June |
|---|---|---|---|---|---|
| 0.094 | 0.115 | 0.168 | 0.202 | 0.225 | 0.232 |
| July | Augustus | September | October | November | December |
| 0.254 | 0.250 | 0.207 | 0.167 | 0.119 | 0.09 |

## IV. BIO-RETENTION AS LID CONTROL

LID controls are represented by a combination of vertical layers whose properties are defined on a per-unit-area basis. This allows an LID of the same design but differing coverage area to easily be placed within different sub-catchments of a study area. During a simulation, SWMM performs a moisture balance that keeps track of how much water moves between and is stored within each LID layer. If the bio-retention basin is full and water is leaving the upper weir, the flow is divided in two flows: the lower flow discharging from the bottom orifice directly draining to the point of compliance and the upper flow is routed at the top of the bio-retention basin and after routing, discharged to the point of compliance. In this project, we used 100% of the area of this specific sub-catchment for bio-retention. In SWMM a divider was used to model this condition. All sub-catchments in one tributary area were directed to a Flow Divider. A Flow Divider is a drainage system node that diverts inflow to a specific conduit in a prescribed manner such as a cutoff type. A Flow Divider with a cutoff type diverts all inflow above a defined cutoff value, in this case we used an orifice equation: Discharge= $q = CA[2g(h\text{-}Hd)]^{0.5}$.
A detention basin sub routine was added at the top of the bio-retention where a weir is added for control purposes, and the storage curve is also provided, see the next section "Modeling bio-retention surface ponding in SWMM 5.0". For a bio-retention strip, the drain coefficient is a 0.5 inches underdrain orifice with 24" gravel storage for all bio-retention systems is 0.0124 in/hr and 2 inches for the ponds resulting 0.2243 in/hr.

### *1. Surface*

Storage Depth

When confining walls or berms are present, this is the maximum depth to which water can pond above the surface of the unit before overflow occurs (in inches). In this project, storage depth was assumed as 2" (bio-retention strips) and 6" (bio-retention ponds) to detain the water quality volume.

Vegetation Volume Fraction

It is the fraction of the volume within the storage depth that is filled with vegetation. This is the volume occupied by stems and leaves, not their surface area coverage. Normally this volume can be ignored, but may be as high as 0.1 to 0.2 for very dense vegetative growth. Based on our visual observation in the field, the average type of vegetation for this site is a low-density vegetation type. Therefore, we used 0.1 for the vegetation volume fraction assuming type of vegetation used is a low-density type.

Surface Roughness

Manning's n value for overland flow over the surface of a vegetative swale. We used n=0.025 for brush roughness.

Surface Slope

Slope of porous pavement surface or vegetative swale (percent). We use 0 percent for bio-retention.

***2. Soil***

Thickness

The thickness of the soil layer (inches). We used a typical value for a rain garden, which is 18 inches for bio-retention strips and 24" for the ponds to promote taller type vegetations.

Porosity

The volume of pore space relative to total volume of soil (as a fraction). We designed it with a soil mix porosity of 0.5 maximum for a good percolation rate (see Table 1 – Soil Infiltration Parameter).

Field Capacity

Volume of pore water relative to total volume after the soil has been allowed to drain fully (as a fraction). We used 0.1 for this soil. Below this level, vertical drainage of water through the soil layer does not occur. (see Table 1 – Soil Infiltration Parameter).

Wilting Point

Volume of pore water relative to total volume for a well-dried soil where only bound water remains (as a fraction). The moisture content of the soil cannot fall below this limit.
We assumed the minimum moisture content within this bio-retention soil is 0.04 (see Table 1 – Soil Infiltration Parameter).

Conductivity

Hydraulic conductivity for the fully saturated soil is 5 inches/hour. This is a design minimum value for percolation rate.

Conductivity Slope

Slope of the curve of log (conductivity) versus soil moisture content (dimensionless). Typical values range from 5 for sands to 15 for silty clay. We designed this soil to have a very good percolation rate therefore the conductivity slope is 5.

Suction Head

The average value of soil capillary suction along the wetting front (inches). This is the same parameter as used in the Green-Ampt infiltration model. Table 1 was utilized to determine the capillary of the soil mix top layer of a bio-retention system. Sandy Loam was considered for approximately 10% clay content and sedimentation collected during a rain event, therefore the suction head will be 2 inches. This is an assumption of a suction head for the soil mix after several years of bio-retention life span.

***3. Storage Layer***

The Storage Layer page of the LID Control Editor describes the properties of the crushed stone or gravel layer used in bio-retention cells as a bottom storage/drainage layer. The following data fields are displayed:

Height

this is the thickness of a gravel layer (inches). Crushed stone and gravel layers are 24 inches thick.

Void Ratio

The volume of void space relative to the volume of solids in the layer. Typical values range from 0.5 to 0.75 for gravel beds. Note that porosity = void ratio / (1 + void ratio). We designed this void ratio to have a value of 0.60.

Conductivity

The rate at which water infiltrates into the native soil below the layer (in inches/hour). This would typically be the Saturated Hydraulic Conductivity of the surrounding sub-catchment if Green-Ampt infiltration is used. Since this is soil type D, we assumed a slow infiltration rate of the native soil, which is 0.025 or 0 for no infiltration.

Clogging Factor

Total volume of treated runoff it takes to completely clog the bottom of the layer divided by the void volume of the layer. A value of 0 was used to ignore clogging since the system does NOT consider infiltration to the native soils. Clogging progressively reduces the Infiltration Rate in direct proportion to the cumulative volume of runoff treated and may only be of concern for infiltration trenches with permeable bottoms and no under drains. We assumed zero for the clogging factor since the infiltration rate is not considered.

***4. Underdrain Layer***

LID storage layers can contain an optional underdrain system that collects stored water from the bottom of the layer and conveys it to a conventional storm drain. The Underdrain page of the LID Control Editor describes the properties of this system. It contains the following data entry fields:

<u>Drain Coefficient and Drain Exponent</u>

Coefficient *C* and exponent *n* that determines the rate of flow through the underdrain as a function of height of stored water above the drain height. The following equation is used to compute this flow rate (per unit area of the LID unit):

$$q = C(h\text{-}Hd)^n$$

where *q* is the outflow (in/hr), *h* is the height of stored water (inches), and *Hd* is the drain height. A typical value for *n* would be 0.5 (making the drain act like an orifice). A rough estimate for *C* can be based on the time *T* that is required to drain a depth *D* of stored water. For $n = 0.5$, $C = 2D^{1/2}/T$. See table 3 for drain coefficient results.

<u>Drain Offset Height</u>

Height of any underdrain piping above the bottom of a storage layer (inches). In this project, this value was set to 0 as the underdrain piping is at the bottom of the storage layer.

## V. RUNNING THE SIMULATION

After setting up all the elements, running the model will take about 10 to 15 minutes on a 2.41 GHz processor. In general, the Run time will depend on the complexity of the watershed being modeled, the routing method used, and the size of the routing time step used. The larger the time steps, the faster the simulation, but the less detailed the results.

***Model Results***

SWMM's Status Report summarizes overall results for the 58-yr simulation. The runoff continuity error is ranging from -4.5 % to -1.03% and the flow routing continuity error is ranging from -0.018% to 0.13%. When a run completes successfully, the mass continuity errors for runoff, flow routing, and pollutant routing will be displayed in the Run Status window. These errors represent the percent difference between initial storage + total inflow and final storage + total outflow for the entire drainage system. If they exceed some reasonable level, such as 10 percent, then the validity of the analysis results must be questioned. The most common reasons for an excessive continuity error are computational time steps that are too long or conduits that are too short.

In addition to the system continuity error, the Status Report produced by a run will list those nodes of the drainage network that have the largest flow continuity errors. If the error for a node is excessive, then one should first consider if the node in question is of importance to the purpose of the simulation. If it is, then further study is warranted to determine how the error might be reduced.

**Bio-retention Surface Storage Outflows**

A statistics tool was used to analyze how often and for what periods of time the bio-retention will have a certain discharge and how the magnitudes of the peak discharges during these periods are distributed. This statistics tool can be found on SWMM's main menu bar by selecting Report|Statistics or by clicking the statistics icon (Σ) on SWMM's main toolbar.

The variable to be analyzed is total inflow; the time period used to define events is "**Event-Dependent**", meaning that separate events will be defined by consecutive reporting periods where certain event threshold conditions are met. Within each such period, the statistic to be analyzed is the **Peak** value of total inflow to the node. The threshold criteria states that a new event begins whenever an inflow of a minimum specific flow rate that occurs at least 24 hours after the last inflow of that minimum amount was recorded.

The SWMM program generates the report for this statistical query, which contains four tabs. The first section is the Summary Statistic; the second is the Event Listing for the variable under study, the third section is Histogram and the last tab is the Frequency Plot. Table 4 below shows how the Peak Flow Frequency and the exceedance frequency tables were generated for the 2 basins based on the Partial Duration Series Criteria:

Table 4 – Partial Duration Series Criteria

| SCENARIO | SEPARATION EVENT (HOURS) | FLOW FLOOR (CFS) | NUMBER OF EVENTS |
|---|---|---|---|
| PRE-DEVELOPMENT | 24 | 0 | 605 |
| POST-DEVELOPMENT (MITIGATED) | 24 | 0 | 603 |

A separation event is a time period in which runoff does not exceed a prescribed threshold and sets the minimum number or hours that must occur between the end of a rain event and the start of the next rain event.

Flow Floor is the maximum value for the inter-event time period and it allows for separation of events. This value is typically set as an artificially low flow value to generate peak flow frequency and flow duration at a certain criteria.
The number of events corresponds to the total number of the discrete runoff events generated for the long-term rainfall record. Typically at the same value of flow floor, the post-development (un-mitigated) flow will dramatically increase the number of discrete runoff events compared to the pre-development flow.

The SWMM program ranks the partial duration series, the exceedance frequency and the return period. They are computed using the Weibull formula for plotting position. See the flow duration curve and peak flow frequency on the following pages.
To compare the curves of a flow duration series between pre-development and mitigated post-development, the pre-development flow floor is set to a very low number (based on 0.002 cfs/acre) while the others are set with a higher value by trial and error so that the number of discrete runoff events become equal to or less than that of the pre-development. A closer number of events to the pre-development's number of events will generate a closer range of exceedance frequency for the mitigated or unmitigated post-development. It is important to have an equal number of events between the pre- and the mitigated post-development so that the exceedance frequencies have exact similar values. Therefore, flow duration curves between the pre- and the mitigated post-development can be compared equally and correctly.

## *VI. RESULT ANALYSIS*

These graphs below were generated from Peak Flow Frequency and Flow Duration Statistics computed by the SWMM program see Appendix A for complete datasets.

**For bio-retention with 0.066 acres of impervious tributary area**

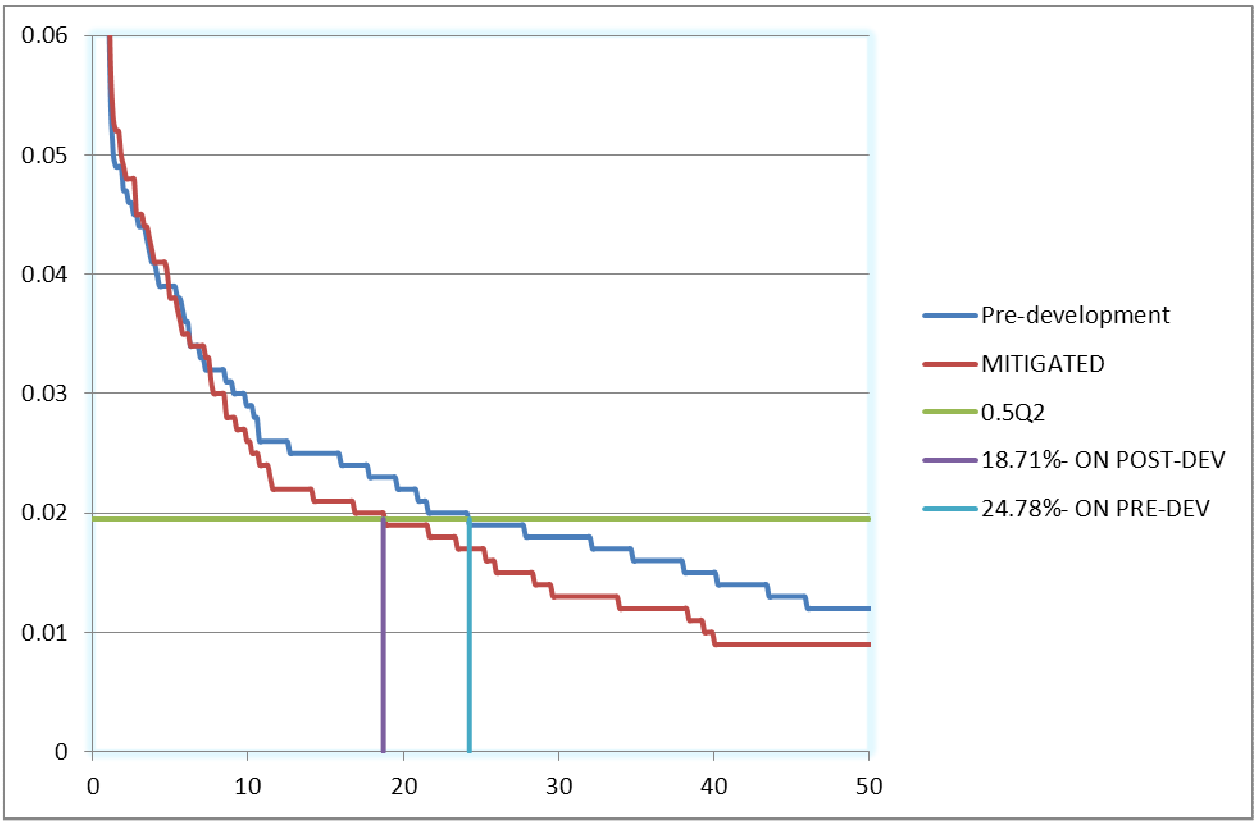
**a. Flow Duration Curve Analysis**

Under Pre-Development conditions the minimum geomorphically significant flow rate of 0.5Q2 is 0.039 cfs and from the graph on the previous page, flows would equal or exceed this value about 24.78% of the time. This increase in the duration of the geomorphically significant flow after development illustrates why duration control is closely linked to protecting creeks from accelerated erosion. The mitigated post-development shows that flows exceed 0.039 cfs only 18.71% which is less than the pre-development condition. This means the bio-retention system would counteract the effects of the increased pavement associated with development projects.

```
S U M M A R Y   S T A T I S T I C S
==================================
Object  ............. System
Variable ............ Runoff  (CFS)
Event Period ......... Variable
Event Statistic ...... Peak  (CFS)
Event Threshold ...... Runoff > 0.0049  (CFS)
Event Threshold ...... Event Volume > 0.0000 (ft3)
Event Threshold ...... Separation Time >= 24.0  (hr)
Period of Record ..... 01/03/1951 to 05/23/2008

Number of Events ..... 605
Event Frequency*...... 0.013
Minimum Value ........ 0.005
Maximum Value ........ 0.078
Mean Value ........... 0.016
Std. Deviation ....... 0.011
Skewness Coeff. ...... 2.051

*Fraction of all reporting periods belonging to an event.
```

```
S U M M A R Y   S T A T I S T I C S
==================================
Object  ............. Node Out1
Variable ............ Total Inflow  (CFS)
Event Period ......... Variable
Event Statistic ...... Peak  (CFS)
Event Threshold ...... Total Inflow > 0.0040  (CFS)
Event Threshold ...... Event Volume > 0.0000 (ft3)
Event Threshold ...... Separation Time >= 24.0  (hr)
Period of Record ..... 01/03/1951 to 05/23/2008

Number of Events ..... 603
Event Frequency*...... 0.012
Minimum Value ........ 0.004
Maximum Value ........ 0.083
Mean Value ........... 0.013
Std. Deviation ....... 0.011
Skewness Coeff. ...... 2.557

*Fraction of all reporting periods belonging to an event.
```

Figure 5 – Summary Statistics for the pre- and the post-development




**Pass or Fail Criteria**

To evaluate the difference between Pre-development and the mitigated post-development conditions, a pass or fail analysis table is developed. This table compares the peak flow versus the percent time exceeded on each return period of mitigated post-development at the same exceedance frequency values as the pre-development condition in the flow duration curve.

The minimum comparison is started at the 0.5Q2 threshold to the Q10. The flow duration curve for the mitigated post-development is within 110% of the curve for the existing condition. The additional runoff volume generated from developing the site will be released to the downstream storm drain at a flow rate below the 50% of Q2 lower threshold. The project will neither increase peak flow rates between the Q2 and Q10 nor will it increase the peak flows more than 10% at any range.

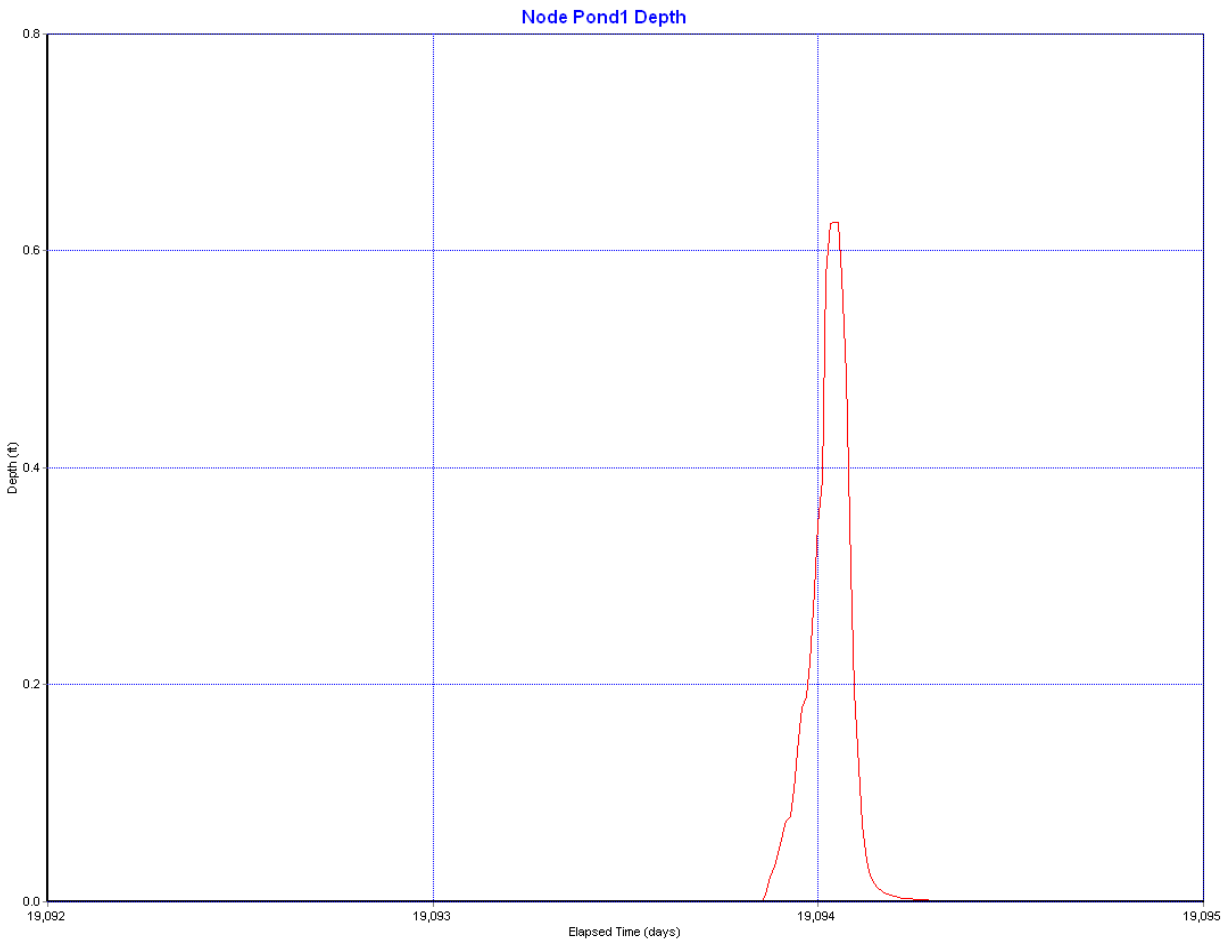
Table 5 –Pass or Fail Criteria

**Drawdown Time of Bio-retention Surface Ponding**

The drawdown time for hydromodification flow control facilities was calculated by assuming a starting water surface elevation coincident with the peak operating level in the bio-retention facility such as the elevation at the weir or the emergency spillway overflow. In continuous modeling, hundreds of hydrographs were created based on the rain data time series. Therefore, the drawdown time should be analyzed statistically. The statistical query is utilized to evaluate the percentage of exceedance frequency of a certain allowable depth of the ponding on a daily basis. The "Daily" option was chosen for the event period because the drawdown time for water quality purposes is 96 hours maximum.

A time series plot was created from the SWMM program by using the statistic values of the exceedance frequency and the dates when they occur to evaluate the pond draining time. The depth at the highest peak flow (occurs at the 58 year storm event), the designated water quality depth and the most frequent depth (typically > 75% exceedance frequency) were chosen to evaluate at extreme conditions or if the daily duration is greater than 24 hours. The daily duration here refers to the "time to peak" on the specific hydrograph.

Figure – 10. Daily depth versus Exceedance Frequency to evaluate drawdown time



The result for all the three criteria is tabularized as follows:

| EXCEEDANCE FREQUENCY | PONDING DEPTH (FT) | DRAWDOWN TIME (DAYS) | MAX. ALLOWABLE DRAWDOWN TIME (DAYS) | PERMIT COMPLIANCE MET |
|---|---|---|---|---|
| 0% | 0.62 | 0.3 | 4 | YES |
| 50% | 0.230 | 0.3 | 4 | YES |
| 75% | 0.080 | 0.3 | 4 | YES |
| AVERAGE | | 0.3 | 4 | YES |

Table 8 – Drawdown time based on Exceedance frequency

**Conclusion:** From the above Table 8, the drawdown time for this Hydromodification bio-retention is released no longer than 4 days (96 hours), therefore the bio-retention surface storage will function as an effective LID control and mitigate the potential vector breeding issues.

| SWMM PRE-DEV | | | SWMM POST-DEV | | | PERMIT COMPLIANCE MET | |
|---|---|---|---|---|---|---|---|
| Return Period (years) | Exceedance Frequency (percent) | Event Peak (CFS) | MITIGATED (CFS) | POST/ PRE (%) | PASS OR FAIL | | |
| 58.0 | 0.17 | 0.078 | 0.083 | 106 | PASS | YES | |
| 29.0 | 0.33 | 0.072 | 0.076 | 106 | PASS | YES | |
| 19.3 | 0.50 | 0.071 | 0.072 | 101 | PASS | YES | |
| 14.5 | 0.66 | 0.067 | 0.070 | 104 | PASS | YES | |
| 11.6 | 0.83 | 0.065 | 0.069 | 106 | PASS | YES | Q10 |
| 9.7 | 0.99 | 0.063 | 0.066 | 105 | PASS | YES | |
| 8.3 | 1.16 | 0.054 | 0.057 | 106 | PASS | YES | |
| 7.3 | 1.32 | 0.050 | 0.053 | 106 | PASS | YES | |
| 6.4 | 1.49 | 0.049 | 0.052 | 106 | PASS | YES | |
| 5.8 | 1.65 | 0.049 | 0.052 | 106 | PASS | YES | |
| 5.3 | 1.82 | 0.049 | 0.050 | 102 | PASS | YES | |
| 4.8 | 1.98 | 0.047 | 0.049 | 104 | PASS | YES | |
| 4.5 | 2.15 | 0.047 | 0.048 | 102 | PASS | YES | |
| 4.1 | 2.31 | 0.046 | 0.048 | 104 | PASS | YES | |
| 3.9 | 2.48 | 0.046 | 0.048 | 104 | PASS | YES | |
| 3.6 | 2.64 | 0.045 | 0.048 | 107 | PASS | YES | |
| 3.4 | 2.81 | 0.045 | 0.045 | 100 | PASS | YES | |
| 3.2 | 2.97 | 0.044 | 0.045 | 102 | PASS | YES | |
| 3.1 | 3.14 | 0.044 | 0.045 | 102 | PASS | YES | |
| 2.9 | 3.30 | 0.044 | 0.044 | 100 | PASS | YES | |
| 2.8 | 3.47 | 0.043 | 0.044 | 102 | PASS | YES | |
| 2.6 | 3.63 | 0.042 | 0.043 | 102 | PASS | YES | |
| 2.5 | 3.80 | 0.041 | 0.042 | 102 | PASS | YES | |
| 2.4 | 3.96 | 0.041 | 0.041 | 100 | PASS | YES | |
| 2.3 | 4.13 | 0.040 | 0.041 | 103 | PASS | YES | |
| 2.2 | 4.29 | 0.039 | 0.041 | 105 | PASS | YES | |
| 2.2 | 4.46 | 0.039 | 0.041 | 105 | PASS | YES | |
| 2.1 | 4.62 | 0.039 | 0.041 | 105 | PASS | YES | |
| 2.0 | 4.79 | 0.039 | 0.040 | 103 | PASS | YES | Q2 |
| 1.9 | 4.95 | 0.039 | 0.038 | 97 | PASS | YES | |
| 1.9 | 5.12 | 0.039 | 0.038 | 97 | PASS | YES | |
| 1.8 | 5.28 | 0.039 | 0.038 | 97 | PASS | YES | |
| 1.8 | 5.45 | 0.038 | 0.037 | 97 | PASS | YES | |
| 1.7 | 5.61 | 0.038 | 0.036 | 95 | PASS | YES | |
| 1.7 | 5.78 | 0.037 | 0.035 | 95 | PASS | YES | |
| 1.6 | 5.94 | 0.036 | 0.035 | 97 | PASS | YES | |
| 1.6 | 6.11 | 0.036 | 0.035 | 97 | PASS | YES | |
| 1.5 | 6.27 | 0.034 | 0.034 | 100 | PASS | YES | |
| 1.5 | 6.44 | 0.034 | 0.034 | 100 | PASS | YES | |
| 1.5 | 6.60 | 0.034 | 0.034 | 100 | PASS | YES | |
| 1.4 | 6.77 | 0.034 | 0.034 | 100 | PASS | YES | |
| 1.4 | 6.93 | 0.033 | 0.034 | 103 | PASS | YES | |
| 1.4 | 7.10 | 0.033 | 0.034 | 103 | PASS | YES | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1.3 | 7.26 | 0.032 | 0.033 | 103 | PASS | YES |
| 1.3 | 7.43 | 0.032 | 0.033 | 103 | PASS | YES |
| 1.3 | 7.59 | 0.032 | 0.031 | 97 | PASS | YES |
| 1.2 | 7.76 | 0.032 | 0.030 | 94 | PASS | YES |
| 1.2 | 7.92 | 0.032 | 0.030 | 94 | PASS | YES |
| 1.2 | 8.09 | 0.032 | 0.030 | 94 | PASS | YES |
| 1.2 | 8.25 | 0.032 | 0.030 | 94 | PASS | YES |
| 1.1 | 8.42 | 0.032 | 0.030 | 94 | PASS | YES |
| 1.1 | 8.58 | 0.031 | 0.028 | 90 | PASS | YES |
| 1.1 | 8.75 | 0.031 | 0.028 | 90 | PASS | YES |
| 1.1 | 8.91 | 0.031 | 0.028 | 90 | PASS | YES |
| 1.1 | 9.08 | 0.030 | 0.028 | 93 | PASS | YES |
| 1.0 | 9.24 | 0.030 | 0.027 | 90 | PASS | YES |
| 1.0 | 9.41 | 0.030 | 0.027 | 90 | PASS | YES |
| 1.0 | 9.57 | 0.030 | 0.027 | 90 | PASS | YES |
| 1.0 | 9.74 | 0.030 | 0.027 | 90 | PASS | YES |
| 1.0 | 9.90 | 0.029 | 0.026 | 90 | PASS | YES |
| 1.0 | 10.07 | 0.029 | 0.026 | 90 | PASS | YES |
| 0.9 | 10.23 | 0.029 | 0.025 | 86 | PASS | YES |
| 0.9 | 10.40 | 0.028 | 0.025 | 89 | PASS | YES |
| 0.9 | 10.56 | 0.028 | 0.025 | 89 | PASS | YES |
| 0.9 | 10.73 | 0.026 | 0.024 | 92 | PASS | YES |
| 0.9 | 10.89 | 0.026 | 0.024 | 92 | PASS | YES |
| 0.9 | 11.06 | 0.026 | 0.024 | 92 | PASS | YES |
| 0.9 | 11.22 | 0.026 | 0.024 | 92 | PASS | YES |
| 0.8 | 11.39 | 0.026 | 0.023 | 88 | PASS | YES |
| 0.8 | 11.55 | 0.026 | 0.022 | 85 | PASS | YES |
| 0.8 | 11.72 | 0.026 | 0.022 | 85 | PASS | YES |
| 0.8 | 11.88 | 0.026 | 0.022 | 85 | PASS | YES |
| 0.8 | 12.05 | 0.026 | 0.022 | 85 | PASS | YES |
| 0.8 | 12.21 | 0.026 | 0.022 | 85 | PASS | YES |
| 0.8 | 12.38 | 0.026 | 0.022 | 85 | PASS | YES |
| 0.8 | 12.54 | 0.026 | 0.022 | 85 | PASS | YES |
| 0.8 | 12.71 | 0.025 | 0.022 | 88 | PASS | YES |
| 0.7 | 12.87 | 0.025 | 0.022 | 88 | PASS | YES |
| 0.7 | 13.04 | 0.025 | 0.022 | 88 | PASS | YES |
| 0.7 | 13.20 | 0.025 | 0.022 | 88 | PASS | YES |
| 0.7 | 13.37 | 0.025 | 0.022 | 88 | PASS | YES |
| 0.7 | 13.53 | 0.025 | 0.022 | 88 | PASS | YES |
| 0.7 | 13.70 | 0.025 | 0.022 | 88 | PASS | YES |
| 0.7 | 13.86 | 0.025 | 0.022 | 88 | PASS | YES |
| 0.7 | 14.03 | 0.025 | 0.022 | 88 | PASS | YES |
| 0.7 | 14.19 | 0.025 | 0.021 | 84 | PASS | YES |
| 0.7 | 14.36 | 0.025 | 0.021 | 84 | PASS | YES |
| 0.7 | 14.52 | 0.025 | 0.021 | 84 | PASS | YES |
| 0.7 | 14.69 | 0.025 | 0.021 | 84 | PASS | YES |
| 0.6 | 14.85 | 0.025 | 0.021 | 84 | PASS | YES |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0.6 | 15.02 | 0.025 | 0.021 | 84 | PASS | YES | |
| 0.6 | 15.18 | 0.025 | 0.021 | 84 | PASS | YES | |
| 0.6 | 15.35 | 0.025 | 0.021 | 84 | PASS | YES | |
| 0.6 | 15.51 | 0.025 | 0.021 | 84 | PASS | YES | |
| 0.6 | 15.68 | 0.025 | 0.021 | 84 | PASS | YES | |
| 0.6 | 15.84 | 0.025 | 0.021 | 84 | PASS | YES | |
| 0.6 | 16.01 | 0.024 | 0.021 | 88 | PASS | YES | |
| 0.6 | 16.17 | 0.024 | 0.021 | 88 | PASS | YES | |
| 0.6 | 16.34 | 0.024 | 0.021 | 88 | PASS | YES | |
| 0.6 | 16.50 | 0.024 | 0.021 | 88 | PASS | YES | |
| 0.6 | 16.67 | 0.024 | 0.021 | 88 | PASS | YES | |
| 0.6 | 16.83 | 0.024 | 0.020 | 83 | PASS | YES | |
| 0.6 | 17.00 | 0.024 | 0.020 | 83 | PASS | YES | |
| 0.6 | 17.16 | 0.024 | 0.020 | 83 | PASS | YES | |
| 0.6 | 17.33 | 0.024 | 0.020 | 83 | PASS | YES | |
| 0.6 | 17.49 | 0.024 | 0.020 | 83 | PASS | YES | |
| 0.5 | 17.66 | 0.024 | 0.020 | 83 | PASS | YES | |
| 0.5 | 17.82 | 0.023 | 0.020 | 87 | PASS | YES | |
| 0.5 | 17.99 | 0.023 | 0.020 | 87 | PASS | YES | |
| 0.5 | 18.15 | 0.023 | 0.020 | 87 | PASS | YES | |
| 0.5 | 18.32 | 0.023 | 0.020 | 87 | PASS | YES | |
| 0.5 | 18.48 | 0.023 | 0.020 | 87 | PASS | YES | |
| 0.5 | 18.65 | 0.023 | 0.020 | 87 | PASS | YES | |
| 0.5 | 18.81 | 0.023 | 0.019 | 83 | PASS | YES | |
| 0.5 | 18.98 | 0.023 | 0.019 | 83 | PASS | YES | |
| 0.5 | 19.14 | 0.023 | 0.019 | 83 | PASS | YES | |
| 0.5 | 19.31 | 0.023 | 0.019 | 83 | PASS | YES | |
| 0.5 | 19.47 | 0.023 | 0.019 | 83 | PASS | YES | |
| 0.5 | 19.64 | 0.022 | 0.019 | 86 | PASS | YES | |
| 0.5 | 19.80 | 0.022 | 0.019 | 86 | PASS | YES | |
| 0.5 | 19.97 | 0.022 | 0.019 | 86 | PASS | YES | |
| 0.5 | 20.13 | 0.022 | 0.019 | 86 | PASS | YES | |
| 0.5 | 20.30 | 0.022 | 0.019 | 86 | PASS | YES | |
| 0.5 | 20.46 | 0.022 | 0.019 | 86 | PASS | YES | |
| 0.5 | 20.63 | 0.022 | 0.019 | 86 | PASS | YES | |
| 0.5 | 20.79 | 0.022 | 0.019 | 86 | PASS | YES | |
| 0.5 | 20.96 | 0.021 | 0.019 | 90 | PASS | YES | 0.5Q2 Onp |
| 0.5 | 21.12 | 0.021 | 0.019 | 90 | PASS | YES | |
| 0.5 | 21.29 | 0.021 | 0.019 | 90 | PASS | YES | |
| 0.5 | 21.45 | 0.021 | 0.019 | 90 | PASS | YES | |
| 0.4 | 21.62 | 0.020 | 0.018 | 90 | PASS | YES | |
| 0.4 | 21.78 | 0.020 | 0.018 | 90 | PASS | YES | |
| 0.4 | 21.95 | 0.020 | 0.018 | 90 | PASS | YES | |
| 0.4 | 22.11 | 0.020 | 0.018 | 90 | PASS | YES | |
| 0.4 | 22.28 | 0.020 | 0.018 | 90 | PASS | YES | |
| 0.4 | 22.44 | 0.020 | 0.018 | 90 | PASS | YES | |
| 0.4 | 22.61 | 0.020 | 0.018 | 90 | PASS | YES | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0.4 | 22.77 | 0.020 | 0.018 | 90 | PASS | YES | |
| 0.4 | 22.94 | 0.020 | 0.018 | 90 | PASS | YES | 0.5Q2 ON F |
| 0.4 | 23.10 | 0.020 | 0.018 | 90 | PASS | YES | |
| 0.4 | 23.27 | 0.020 | 0.018 | 90 | PASS | YES | |
| 0.4 | 23.43 | 0.020 | 0.017 | 85 | PASS | YES | |
| 0.4 | 23.60 | 0.020 | 0.017 | 85 | PASS | YES | |
| 0.4 | 23.76 | 0.020 | 0.017 | 85 | PASS | YES | |
| 0.4 | 23.93 | 0.020 | 0.017 | 85 | PASS | YES | |
| 0.4 | 24.09 | 0.020 | 0.017 | 85 | PASS | YES | |
| 0.4 | 24.26 | 0.019 | 0.017 | 89 | PASS | YES | |
| 0.4 | 24.42 | 0.019 | 0.017 | 89 | PASS | YES | |
| 0.4 | 24.59 | 0.019 | 0.017 | 89 | PASS | YES | |
| 0.4 | 24.75 | 0.019 | 0.017 | 89 | PASS | YES | |
| 0.4 | 24.92 | 0.019 | 0.017 | 89 | PASS | YES | |
| 0.4 | 25.08 | 0.019 | 0.017 | 89 | PASS | YES | |
| 0.4 | 25.25 | 0.019 | 0.016 | 84 | PASS | YES | |
| 0.4 | 25.41 | 0.019 | 0.016 | 84 | PASS | YES | |
| 0.4 | 25.58 | 0.019 | 0.016 | 84 | PASS | YES | |
| 0.4 | 25.74 | 0.019 | 0.016 | 84 | PASS | YES | |
| 0.4 | 25.91 | 0.019 | 0.015 | 79 | PASS | YES | |
| 0.4 | 26.07 | 0.019 | 0.015 | 79 | PASS | YES | |
| 0.4 | 26.24 | 0.019 | 0.015 | 79 | PASS | YES | |
| 0.4 | 26.40 | 0.019 | 0.015 | 79 | PASS | YES | |
| 0.4 | 26.57 | 0.019 | 0.015 | 79 | PASS | YES | |
| 0.4 | 26.73 | 0.019 | 0.015 | 79 | PASS | YES | |
| 0.4 | 26.90 | 0.019 | 0.015 | 79 | PASS | YES | |
| 0.4 | 27.06 | 0.019 | 0.015 | 79 | PASS | YES | |
| 0.4 | 27.23 | 0.019 | 0.015 | 79 | PASS | YES | |
| 0.4 | 27.39 | 0.019 | 0.015 | 79 | PASS | YES | |
| 0.4 | 27.56 | 0.019 | 0.015 | 79 | PASS | YES | |
| 0.4 | 27.72 | 0.019 | 0.015 | 79 | PASS | YES | |
| 0.3 | 27.89 | 0.018 | 0.015 | 83 | PASS | YES | |
| 0.3 | 28.05 | 0.018 | 0.015 | 83 | PASS | YES | |
| 0.3 | 28.22 | 0.018 | 0.015 | 83 | PASS | YES | |
| 0.3 | 28.38 | 0.018 | 0.014 | 78 | PASS | YES | |
| 0.3 | 28.55 | 0.018 | 0.014 | 78 | PASS | YES | |
| 0.3 | 28.71 | 0.018 | 0.014 | 78 | PASS | YES | |
| 0.3 | 28.88 | 0.018 | 0.014 | 78 | PASS | YES | |
| 0.3 | 29.04 | 0.018 | 0.014 | 78 | PASS | YES | |
| 0.3 | 29.21 | 0.018 | 0.014 | 78 | PASS | YES | |
| 0.3 | 29.37 | 0.018 | 0.014 | 78 | PASS | YES | |
| 0.3 | 29.54 | 0.018 | 0.013 | 72 | PASS | YES | |
| 0.3 | 29.70 | 0.018 | 0.013 | 72 | PASS | YES | |
| 0.3 | 29.87 | 0.018 | 0.013 | 72 | PASS | YES | |
| 0.3 | 30.03 | 0.018 | 0.013 | 72 | PASS | YES | |
| 0.3 | 30.20 | 0.018 | 0.013 | 72 | PASS | YES | |
| 0.3 | 30.36 | 0.018 | 0.013 | 72 | PASS | YES | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0.3 | 30.53 | 0.018 | 0.013 | 72 | PASS | YES |
| 0.3 | 30.69 | 0.018 | 0.013 | 72 | PASS | YES |
| 0.3 | 30.86 | 0.018 | 0.013 | 72 | PASS | YES |
| 0.3 | 31.02 | 0.018 | 0.013 | 72 | PASS | YES |
| 0.3 | 31.19 | 0.018 | 0.013 | 72 | PASS | YES |
| 0.3 | 31.35 | 0.018 | 0.013 | 72 | PASS | YES |
| 0.3 | 31.52 | 0.018 | 0.013 | 72 | PASS | YES |
| 0.3 | 31.68 | 0.018 | 0.013 | 72 | PASS | YES |
| 0.3 | 31.85 | 0.018 | 0.013 | 72 | PASS | YES |
| 0.3 | 32.01 | 0.018 | 0.013 | 72 | PASS | YES |
| 0.3 | 32.18 | 0.017 | 0.013 | 76 | PASS | YES |
| 0.3 | 32.34 | 0.017 | 0.013 | 76 | PASS | YES |
| 0.3 | 32.51 | 0.017 | 0.013 | 76 | PASS | YES |
| 0.3 | 32.67 | 0.017 | 0.013 | 76 | PASS | YES |
| 0.3 | 32.84 | 0.017 | 0.013 | 76 | PASS | YES |
| 0.3 | 33.00 | 0.017 | 0.013 | 76 | PASS | YES |
| 0.3 | 33.17 | 0.017 | 0.013 | 76 | PASS | YES |
| 0.3 | 33.33 | 0.017 | 0.013 | 76 | PASS | YES |
| 0.3 | 33.50 | 0.017 | 0.013 | 76 | PASS | YES |
| 0.3 | 33.66 | 0.017 | 0.013 | 76 | PASS | YES |
| 0.3 | 33.83 | 0.017 | 0.012 | 71 | PASS | YES |
| 0.3 | 33.99 | 0.017 | 0.012 | 71 | PASS | YES |
| 0.3 | 34.16 | 0.017 | 0.012 | 71 | PASS | YES |
| 0.3 | 34.32 | 0.017 | 0.012 | 71 | PASS | YES |
| 0.3 | 34.49 | 0.017 | 0.012 | 71 | PASS | YES |
| 0.3 | 34.65 | 0.017 | 0.012 | 71 | PASS | YES |
| 0.3 | 34.82 | 0.016 | 0.012 | 75 | PASS | YES |
| 0.3 | 34.98 | 0.016 | 0.012 | 75 | PASS | YES |
| 0.3 | 35.15 | 0.016 | 0.012 | 75 | PASS | YES |
| 0.3 | 35.31 | 0.016 | 0.012 | 75 | PASS | YES |
| 0.3 | 35.48 | 0.016 | 0.012 | 75 | PASS | YES |
| 0.3 | 35.64 | 0.016 | 0.012 | 75 | PASS | YES |
| 0.3 | 35.81 | 0.016 | 0.012 | 75 | PASS | YES |
| 0.3 | 35.97 | 0.016 | 0.012 | 75 | PASS | YES |
| 0.3 | 36.14 | 0.016 | 0.012 | 75 | PASS | YES |
| 0.3 | 36.30 | 0.016 | 0.012 | 75 | PASS | YES |
| 0.3 | 36.47 | 0.016 | 0.012 | 75 | PASS | YES |
| 0.3 | 36.63 | 0.016 | 0.012 | 75 | PASS | YES |
| 0.3 | 36.80 | 0.016 | 0.012 | 75 | PASS | YES |
| 0.3 | 36.96 | 0.016 | 0.012 | 75 | PASS | YES |
| 0.3 | 37.13 | 0.016 | 0.012 | 75 | PASS | YES |
| 0.3 | 37.29 | 0.016 | 0.012 | 75 | PASS | YES |
| 0.3 | 37.46 | 0.016 | 0.012 | 75 | PASS | YES |
| 0.3 | 37.62 | 0.016 | 0.012 | 75 | PASS | YES |
| 0.3 | 37.79 | 0.016 | 0.012 | 75 | PASS | YES |
| 0.3 | 37.95 | 0.016 | 0.012 | 75 | PASS | YES |
| 0.3 | 38.12 | 0.015 | 0.012 | 80 | PASS | YES |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0.3 | 38.28 | 0.015 | 0.011 | 73 | PASS | YES | |
| 0.3 | 38.45 | 0.015 | 0.011 | 73 | PASS | YES | |
| 0.3 | 38.61 | 0.015 | 0.011 | 73 | PASS | YES | |
| 0.3 | 38.94 | 0.015 | 0.011 | 73 | PASS | YES | |
| 0.3 | 38.94 | 0.015 | 0.011 | 73 | PASS | YES | |
| 0.2 | 39.11 | 0.015 | 0.011 | 73 | PASS | YES | |
| 0.2 | 39.27 | 0.015 | 0.010 | 67 | PASS | YES | |
| 0.2 | 39.44 | 0.015 | 0.010 | 67 | PASS | YES | |
| 0.2 | 39.60 | 0.015 | 0.010 | 67 | PASS | YES | |
| 0.2 | 39.77 | 0.015 | 0.010 | 67 | PASS | YES | |
| 0.2 | 39.93 | 0.015 | 0.009 | 60 | PASS | YES | |
| 0.2 | 40.10 | 0.015 | 0.009 | 60 | PASS | YES | |
| 0.2 | 40.26 | 0.014 | 0.009 | 64 | PASS | YES | |
| 0.2 | 40.43 | 0.014 | 0.009 | 64 | PASS | YES | |
| 0.2 | 40.59 | 0.014 | 0.009 | 64 | PASS | YES | |
| 0.2 | 40.76 | 0.014 | 0.009 | 64 | PASS | YES | |
| 0.2 | 40.92 | 0.014 | 0.009 | 64 | PASS | YES | |
| 0.2 | 41.09 | 0.014 | 0.009 | 64 | PASS | YES | |
| 0.2 | 41.25 | 0.014 | 0.009 | 64 | PASS | YES | |
| 0.2 | 41.42 | 0.014 | 0.009 | 64 | PASS | YES | |
| 0.2 | 41.58 | 0.014 | 0.009 | 64 | PASS | YES | |
| 0.2 | 41.75 | 0.014 | 0.009 | 64 | PASS | YES | |
| 0.2 | 41.91 | 0.014 | 0.009 | 64 | PASS | YES | |
| 0.2 | 42.08 | 0.014 | 0.009 | 64 | PASS | YES | |
| 0.2 | 42.24 | 0.014 | 0.009 | 64 | PASS | YES | |
| 0.2 | 42.41 | 0.014 | 0.009 | 64 | PASS | YES | |
| 0.2 | 42.57 | 0.014 | 0.009 | 64 | PASS | YES | |
| 0.2 | 42.74 | 0.014 | 0.009 | 64 | PASS | YES | |
| 0.2 | 43.07 | 0.014 | 0.009 | 64 | PASS | YES | |
| 0.2 | 43.07 | 0.014 | 0.009 | 64 | PASS | YES | |
| 0.2 | 43.23 | 0.014 | 0.009 | 64 | PASS | YES | |
| 0.2 | 43.40 | 0.014 | 0.009 | 64 | PASS | YES | |
| 0.2 | 43.56 | 0.013 | 0.009 | 69 | PASS | YES | |
| 0.2 | 43.73 | 0.013 | 0.009 | 69 | PASS | YES | |
| 0.2 | 43.89 | 0.013 | 0.009 | 69 | PASS | YES | |
| 0.2 | 44.06 | 0.013 | 0.009 | 69 | PASS | YES | |
| 0.2 | 44.22 | 0.013 | 0.009 | 69 | PASS | YES | |
| 0.2 | 44.39 | 0.013 | 0.009 | 69 | PASS | YES | 0.1Q2 |
| 0.2 | 44.55 | 0.013 | 0.009 | 69 | PASS | YES | |
| 0.2 | 44.72 | 0.013 | 0.009 | 69 | PASS | YES | |
| 0.2 | 44.88 | 0.013 | 0.009 | 69 | PASS | YES | |
| 0.2 | 45.05 | 0.013 | 0.009 | 69 | PASS | YES | |
| 0.2 | 45.21 | 0.013 | 0.009 | 69 | PASS | YES | |
| 0.2 | 45.38 | 0.013 | 0.009 | 69 | PASS | YES | |
| 0.2 | 45.54 | 0.013 | 0.009 | 69 | PASS | YES | |
| 0.2 | 45.71 | 0.013 | 0.009 | 69 | PASS | YES | |
| 0.2 | 45.87 | 0.013 | 0.009 | 69 | PASS | YES | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0.2 | 46.04 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 46.20 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 46.37 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 46.53 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 46.70 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 46.86 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 47.03 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 47.19 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 47.36 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 47.52 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 47.69 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 47.85 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 48.02 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 48.18 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 48.35 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 48.51 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 48.68 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 48.84 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 49.01 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 49.17 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 49.34 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 49.50 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 49.67 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 49.83 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 50.00 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 50.17 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 50.33 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 50.50 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 50.66 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 50.83 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 50.99 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 51.16 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 51.32 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 51.49 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 51.65 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 51.82 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 51.98 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 52.15 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 52.31 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 52.48 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 52.64 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 52.81 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 52.97 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 53.14 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 53.30 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 53.47 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 53.63 | 0.012 | 0.009 | 75 | PASS | YES |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0.2 | 53.80 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 53.96 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 54.13 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 54.29 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 54.46 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 54.62 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 54.79 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 54.95 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 55.12 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 55.28 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 55.45 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 55.61 | 0.012 | 0.009 | 75 | PASS | YES |
| 0.2 | 55.78 | 0.011 | 0.009 | 82 | PASS | YES |
| 0.2 | 55.94 | 0.011 | 0.009 | 82 | PASS | YES |
| 0.2 | 56.11 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 56.27 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 56.44 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 56.60 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 56.77 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 56.93 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 57.10 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 57.26 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 57.43 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 57.59 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 57.76 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 57.92 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 58.09 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 58.25 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 58.42 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 58.58 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 58.75 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 58.91 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 59.08 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 59.24 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 59.41 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 59.57 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 59.74 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 59.90 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 60.07 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 60.23 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 60.40 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 60.56 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 60.73 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 60.89 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 61.06 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 61.22 | 0.011 | 0.008 | 73 | PASS | YES |
| 0.2 | 61.39 | 0.010 | 0.008 | 80 | PASS | YES |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0.2 | 61.55 | 0.010 | 0.008 | 80 | PASS | YES |
| 0.2 | 61.72 | 0.010 | 0.008 | 80 | PASS | YES |
| 0.2 | 61.88 | 0.010 | 0.008 | 80 | PASS | YES |
| 0.2 | 62.05 | 0.010 | 0.008 | 80 | PASS | YES |
| 0.2 | 62.21 | 0.010 | 0.008 | 80 | PASS | YES |
| 0.2 | 62.38 | 0.010 | 0.008 | 80 | PASS | YES |
| 0.2 | 62.54 | 0.010 | 0.008 | 80 | PASS | YES |
| 0.2 | 62.71 | 0.010 | 0.008 | 80 | PASS | YES |
| 0.2 | 62.87 | 0.010 | 0.007 | 70 | PASS | YES |
| 0.2 | 63.04 | 0.010 | 0.007 | 70 | PASS | YES |
| 0.2 | 63.20 | 0.010 | 0.007 | 70 | PASS | YES |
| 0.2 | 63.37 | 0.010 | 0.007 | 70 | PASS | YES |
| 0.2 | 63.53 | 0.010 | 0.007 | 70 | PASS | YES |
| 0.2 | 63.70 | 0.010 | 0.007 | 70 | PASS | YES |
| 0.2 | 63.86 | 0.010 | 0.007 | 70 | PASS | YES |
| 0.2 | 64.03 | 0.010 | 0.007 | 70 | PASS | YES |
| 0.2 | 64.19 | 0.010 | 0.007 | 70 | PASS | YES |
| 0.2 | 64.36 | 0.010 | 0.007 | 70 | PASS | YES |
| 0.2 | 64.52 | 0.010 | 0.007 | 70 | PASS | YES |
| 0.2 | 64.69 | 0.010 | 0.007 | 70 | PASS | YES |
| 0.2 | 64.85 | 0.010 | 0.007 | 70 | PASS | YES |
| 0.2 | 65.02 | 0.010 | 0.007 | 70 | PASS | YES |
| 0.2 | 65.18 | 0.010 | 0.007 | 70 | PASS | YES |
| 0.2 | 65.35 | 0.010 | 0.007 | 70 | PASS | YES |
| 0.2 | 65.51 | 0.010 | 0.007 | 70 | PASS | YES |
| 0.2 | 65.68 | 0.010 | 0.007 | 70 | PASS | YES |
| 0.2 | 65.84 | 0.010 | 0.007 | 70 | PASS | YES |
| 0.1 | 66.01 | 0.010 | 0.007 | 70 | PASS | YES |
| 0.1 | 66.17 | 0.010 | 0.007 | 70 | PASS | YES |
| 0.1 | 66.34 | 0.010 | 0.007 | 70 | PASS | YES |
| 0.1 | 66.50 | 0.009 | 0.007 | 78 | PASS | YES |
| 0.1 | 66.67 | 0.009 | 0.007 | 78 | PASS | YES |
| 0.1 | 66.83 | 0.009 | 0.007 | 78 | PASS | YES |
| 0.1 | 67.00 | 0.009 | 0.007 | 78 | PASS | YES |
| 0.1 | 67.16 | 0.009 | 0.007 | 78 | PASS | YES |
| 0.1 | 67.33 | 0.009 | 0.007 | 78 | PASS | YES |
| 0.1 | 67.49 | 0.009 | 0.007 | 78 | PASS | YES |
| 0.1 | 67.66 | 0.009 | 0.007 | 78 | PASS | YES |
| 0.1 | 67.82 | 0.009 | 0.007 | 78 | PASS | YES |
| 0.1 | 67.99 | 0.009 | 0.007 | 78 | PASS | YES |
| 0.1 | 68.15 | 0.009 | 0.007 | 78 | PASS | YES |
| 0.1 | 68.32 | 0.009 | 0.007 | 78 | PASS | YES |
| 0.1 | 68.48 | 0.009 | 0.007 | 78 | PASS | YES |
| 0.1 | 68.65 | 0.009 | 0.007 | 78 | PASS | YES |
| 0.1 | 68.81 | 0.009 | 0.007 | 78 | PASS | YES |
| 0.1 | 68.98 | 0.009 | 0.007 | 78 | PASS | YES |
| 0.1 | 69.14 | 0.009 | 0.007 | 78 | PASS | YES |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0.1 | 69.31 | 0.009 | 0.007 | 78 | PASS | YES |
| 0.1 | 69.47 | 0.009 | 0.007 | 78 | PASS | YES |
| 0.1 | 69.64 | 0.009 | 0.006 | 67 | PASS | YES |
| 0.1 | 69.80 | 0.009 | 0.006 | 67 | PASS | YES |
| 0.1 | 69.97 | 0.009 | 0.006 | 67 | PASS | YES |
| 0.1 | 70.13 | 0.009 | 0.006 | 67 | PASS | YES |
| 0.1 | 70.30 | 0.009 | 0.006 | 67 | PASS | YES |
| 0.1 | 70.46 | 0.009 | 0.006 | 67 | PASS | YES |
| 0.1 | 70.63 | 0.009 | 0.006 | 67 | PASS | YES |
| 0.1 | 70.79 | 0.009 | 0.006 | 67 | PASS | YES |
| 0.1 | 70.96 | 0.009 | 0.006 | 67 | PASS | YES |
| 0.1 | 71.12 | 0.009 | 0.006 | 67 | PASS | YES |
| 0.1 | 71.29 | 0.009 | 0.006 | 67 | PASS | YES |
| 0.1 | 71.45 | 0.009 | 0.006 | 67 | PASS | YES |
| 0.1 | 71.62 | 0.009 | 0.006 | 67 | PASS | YES |
| 0.1 | 71.78 | 0.009 | 0.006 | 67 | PASS | YES |
| 0.1 | 71.95 | 0.009 | 0.006 | 67 | PASS | YES |
| 0.1 | 72.11 | 0.008 | 0.006 | 75 | PASS | YES |
| 0.1 | 72.28 | 0.008 | 0.006 | 75 | PASS | YES |
| 0.1 | 72.44 | 0.008 | 0.006 | 75 | PASS | YES |
| 0.1 | 72.61 | 0.008 | 0.006 | 75 | PASS | YES |
| 0.1 | 72.77 | 0.008 | 0.006 | 75 | PASS | YES |
| 0.1 | 72.94 | 0.008 | 0.006 | 75 | PASS | YES |
| 0.1 | 73.10 | 0.008 | 0.006 | 75 | PASS | YES |
| 0.1 | 73.27 | 0.008 | 0.006 | 75 | PASS | YES |
| 0.1 | 73.43 | 0.008 | 0.006 | 75 | PASS | YES |
| 0.1 | 73.60 | 0.008 | 0.006 | 75 | PASS | YES |
| 0.1 | 73.76 | 0.008 | 0.006 | 75 | PASS | YES |
| 0.1 | 73.93 | 0.008 | 0.006 | 75 | PASS | YES |
| 0.1 | 74.09 | 0.008 | 0.006 | 75 | PASS | YES |
| 0.1 | 74.26 | 0.008 | 0.006 | 75 | PASS | YES |
| 0.1 | 74.42 | 0.008 | 0.006 | 75 | PASS | YES |
| 0.1 | 74.59 | 0.008 | 0.006 | 75 | PASS | YES |
| 0.1 | 74.75 | 0.008 | 0.006 | 75 | PASS | YES |
| 0.1 | 74.92 | 0.007 | 0.006 | 86 | PASS | YES |
| 0.1 | 75.08 | 0.007 | 0.006 | 86 | PASS | YES |
| 0.1 | 75.25 | 0.007 | 0.006 | 86 | PASS | YES |
| 0.1 | 75.41 | 0.007 | 0.006 | 86 | PASS | YES |
| 0.1 | 75.58 | 0.007 | 0.006 | 86 | PASS | YES |
| 0.1 | 75.74 | 0.007 | 0.006 | 86 | PASS | YES |
| 0.1 | 75.91 | 0.007 | 0.006 | 86 | PASS | YES |
| 0.1 | 76.07 | 0.007 | 0.006 | 86 | | |
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# APPENDIX 6

# WATER SURFACE CALCULATION WITH HECRAS

```
                    HEC-RAS Version 4.1.0 Jan 2010
                     U.S. Army Corps of Engineers
                    Hydrologic Engineering Center
                          609 Second Street
                          Davis, California


          X     X  XXXXXX    XXXX        XXXX       XX      XXXX
          X     X  X        X    X       X   X     X  X    X
          X     X  X        X            X   X    X    X   X
          XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
          X     X  X        X            X  X     X    X        X
          X     X  X        X    X       X   X    X    X        X
          X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: PRE-DEVELOPMENT
Project File : PRE-DEVELOPMENT.prj
Run Date and Time: 2/19/2013 9:43:12 AM

Project in English units

PLAN DATA

Plan Title: Plan 07
Plan File : q:\12\12052\TM\TM1\HYD\HECRAS\CROSS SECTION\PRE-DEVELOPMENT.p07

Geometry Title: geo-post-dev
Geometry File : q:\12\12052\TM\TM1\HYD\HECRAS\CROSS SECTION\PRE-DEVELOPMENT.g02

Flow Title : pre-dev flow
Flow File : q:\12\12052\TM\TM1\HYD\HECRAS\CROSS SECTION\PRE-DEVELOPMENT.f01

Plan Summary Information:
Number of: Cross Sections = 18 Multiple Openings = 0
Culverts = 1 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: pre-dev flow
Flow File : q:\12\12052\TM\TM1\HYD\HECRAS\CROSS SECTION\PRE-DEVELOPMENT.f01

Flow Data (cfs)

| River | Reach | RS | 100 yr |
|---|---|---|---|
| Agua Hedionda | SM Highlands | 18 | 362.1 |
| Agua Hedionda | SM Highlands | 13 | 674.7 |
| Agua Hedionda | SM Highlands | 6 | 924 |

Boundary Conditions

| River | Reach | Profile | Upstream | Downstream |
|---|---|---|---|---|
| Agua Hedionda | SM Highlands | 100 yr | | Critical |

GEOMETRY DATA

Geometry Title: geo-post-dev
Geometry File : q:\12\12052\TM\TM1\HYD\HECRAS\CROSS SECTION\PRE-DEVELOPMENT.g02

CROSS SECTION

RIVER: Agua Hedionda
REACH: SM Highlands RS: 18

INPUT
Description:
Station Elevation Data num= 16

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 734.4 | 42.56 | 732.64 | 87 | 732 | 109.57 | 729.92 | 146.3 | 729 |
| 212.31 | 715 | 265.43 | 704.95 | 291.31 | 703 | 367.1 | 705.93 | 368.78 | 705.24 |
| 375.71 | 709 | 388.24 | 710 | 398.89 | 715 | 489.05 | 716 | 517.58 | 729 |
| 600 | 749.7 | | | | | | | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 0 | .03 | 146.3 | .035 | 398.89 | .03 |

| Bank Sta: Left | Right | Lengths: Left | Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|---|
| 146.3 | 398.89 | 251 | 201 | 149.5 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 705.30 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.47 | Wt. n-Val. | | 0.035 | |
| W.S. Elev (ft) | 704.83 | Reach Len. (ft) | 251.00 | 201.00 | 149.50 |
| Crit W.S. (ft) | 704.83 | Flow Area (sq ft) | | 65.81 | |
| E.G. Slope (ft/ft) | 0.018894 | Area (sq ft) | | 65.81 | |
| Q Total (cfs) | 362.10 | Flow (cfs) | | 362.10 | |
| Top Width (ft) | 71.77 | Top Width (ft) | | 71.77 | |
| Vel Total (ft/s) | 5.50 | Avg. Vel. (ft/s) | | 5.50 | |
| Max Chl Dpth (ft) | 1.83 | Hydr. Depth (ft) | | 0.92 | |
| Conv. Total (cfs) | 2634.3 | Conv. (cfs) | | 2634.3 | |
| Length Wtd. (ft) | 201.00 | Wetted Per. (ft) | | 71.88 | |
| Min Ch El (ft) | 703.00 | Shear (lb/sq ft) | | 1.08 | |
| Alpha | 1.00 | Stream Power (lb/ft s) | 600.00 | 0.00 | 0.00 |
| Frctn Loss (ft) | 3.75 | Cum Volume (acre-ft) | | 21.97 | |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | | 8.40 | |

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION

RIVER: Agua Hedionda
REACH: SM Highlands RS: 17

INPUT
Description:
Station Elevation Data num= 14

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 714.61 | 38.49 | 710.59 | 147.06 | 709.2 | 192.29 | 706.35 | 204.23 | 706.36 |
| 246.05 | 700 | 272.27 | 696 | 297.8 | 693.33 | 315.3 | 695.57 | 338.11 | 695.98 |
| 414.27 | 702.97 | 437.9 | 711.01 | 522.35 | 713.98 | 600.01 | 732.47 | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 0 | .03 | 204.23 | .035 | 414.27 | .03 |

| Bank Sta: Left | Right | Lengths: Left | Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|---|
| 204.23 | 414.27 | 170 | 200 | 230 | .1 | .3 |

CROSS SECTION OUTPUT  Profile #100 yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 696.46 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.51 | Wt. n-Val. | | 0.035 | |
| W.S. Elev (ft) | 695.96 | Reach Len. (ft) | 170.00 | 200.00 | 230.00 |
| Crit W.S. (ft) | 695.96 | Flow Area (sq ft) | | 63.44 | |
| E.G. Slope (ft/ft) | 0.018420 | Area (sq ft) | | 63.44 | |
| Q Total (cfs) | 362.10 | Flow (cfs) | | 362.10 | |
| Top Width (ft) | 64.05 | Top Width (ft) | | 64.05 | |
| Vel Total (ft/s) | 5.71 | Avg. Vel. (ft/s) | | 5.71 | |
| Max Chl Dpth (ft) | 2.63 | Hydr. Depth (ft) | | 0.99 | |
| Conv. Total (cfs) | 2668.0 | Conv. (cfs) | | 2668.0 | |
| Length Wtd. (ft) | 200.00 | Wetted Per. (ft) | | 64.34 | |
| Min Ch El (ft) | 693.33 | Shear (lb/sq ft) | | 1.13 | |
| Alpha | 1.00 | Stream Power (lb/ft s) | 600.01 | 0.00 | 0.00 |
| Frctn Loss (ft) | 3.60 | Cum Volume (acre-ft) | | 21.67 | |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | | 8.08 | |

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth.  This indicates that there is not a valid subcritical answer.  The program
defaulted to critical depth.

CROSS SECTION

RIVER: Agua Hedionda
REACH: SM Highlands  RS: 16

INPUT
Description:
Station Elevation Data  num=  11

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 720.8 | 22.87 | 715 | 85.69 | 704.95 | 142.68 | 699.56 | 257.7 | 690.78 |
| 299.85 | 685.21 | 332.6 | 686.18 | 371.62 | 692 | 425.35 | 693.86 | 540.3 | 712.74 |
| 600 | 718.48 | | | | | | | | |

Manning's n Values  num=  3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 0 | .03 | 142.68 | .035 | 425.35 | .03 |

| Bank Sta: Left | Right | Lengths: Left | Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|---|
| 142.68 | 425.35 | 201 | 201 | 201 | .1 | .3 |

CROSS SECTION OUTPUT  Profile #100 yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 687.62 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.58 | Wt. n-Val. | | 0.035 | |
| W.S. Elev (ft) | 687.04 | Reach Len. (ft) | 201.00 | 201.00 | 201.00 |
| Crit W.S. (ft) | 687.04 | Flow Area (sq ft) | | 59.32 | |
| E.G. Slope (ft/ft) | 0.017607 | Area (sq ft) | | 59.32 | |
| Q Total (cfs) | 362.10 | Flow (cfs) | | 362.10 | |
| Top Width (ft) | 52.40 | Top Width (ft) | | 52.40 | |
| Vel Total (ft/s) | 6.10 | Avg. Vel. (ft/s) | | 6.10 | |
| Max Chl Dpth (ft) | 1.83 | Hydr. Depth (ft) | | 1.13 | |
| Conv. Total (cfs) | 2728.9 | Conv. (cfs) | | 2728.9 | |
| Length Wtd. (ft) | 201.00 | Wetted Per. (ft) | | 52.60 | |
| Min Ch El (ft) | 685.21 | Shear (lb/sq ft) | | 1.24 | |
| Alpha | 1.00 | Stream Power (lb/ft s) | 600.00 | 0.00 | 0.00 |
| Frctn Loss (ft) | 3.22 | Cum Volume (acre-ft) | | 21.39 | |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | | 7.81 | |

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION

RIVER: Agua Hedionda
REACH: SM Highlands RS: 15

INPUT
Description:
Station Elevation Data num= 11

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 719.45 | 144.68 | 698.46 | 194.72 | 689.85 | 292.93 | 676 | 305.15 | 675.72 |
| 360.63 | 680.2 | 392.5 | 689 | 423.4 | 687.33 | 477.9 | 691.35 | 534.95 | 692.56 |
| 600 | 696.86 | | | | | | | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 0 | .03 | 194.72 | .035 | 392.5 | .03 |

| Bank Sta: Left | Right | Lengths: Left | Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|---|
| 194.72 | 392.5 | 164 | 203 | 238 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 678.33 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.53 | Wt. n-Val. | | 0.035 | |
| W.S. Elev (ft) | 677.80 | Reach Len. (ft) | 164.00 | 203.00 | 238.00 |
| Crit W.S. (ft) | 677.73 | Flow Area (sq ft) | | 61.94 | |
| E.G. Slope (ft/ft) | 0.014611 | Area (sq ft) | | 61.94 | |
| Q Total (cfs) | 362.10 | Flow (cfs) | | 362.10 | |
| Top Width (ft) | 50.72 | Top Width (ft) | | 50.72 | |
| Vel Total (ft/s) | 5.85 | Avg. Vel. (ft/s) | | 5.85 | |
| Max Chl Dpth (ft) | 2.08 | Hydr. Depth (ft) | | 1.22 | |
| Conv. Total (cfs) | 2995.6 | Conv. (cfs) | | 2995.6 | |
| Length Wtd. (ft) | 203.00 | Wetted Per. (ft) | | 50.94 | |
| Min Ch El (ft) | 675.72 | Shear (lb/sq ft) | | 1.11 | |
| Alpha | 1.00 | Stream Power (lb/ft s) | 600.00 | 0.00 | 0.00 |
| Frctn Loss (ft) | 3.35 | Cum Volume (acre-ft) | | 21.11 | |
| C & E Loss (ft) | 0.02 | Cum SA (acres) | | 7.58 | |

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION

RIVER: Agua Hedionda
REACH: SM Highlands RS: 14

INPUT
Description:
Station Elevation Data num= 12

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 700.97 | 46.34 | 698.99 | 123.59 | 692.64 | 229.32 | 680 | 313.98 | 673.84 |
| 356.38 | 672.9 | 380.56 | 675 | 403.47 | 680 | 437.9 | 695 | 476.6 | 702 |
| 547.73 | 716 | 600 | 724.22 | | | | | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 0 | .03 | 229.32 | .035 | 437.9 | .03 |

| Bank Sta: Left | Right | Lengths: Left | Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|---|
| 229.32 | 437.9 | 336 | 221 | 89 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 674.97 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.48 | Wt. n-Val. | | 0.035 | |
| W.S. Elev (ft) | 674.49 | Reach Len. (ft) | 336.00 | 221.00 | 89.00 |
| Crit W.S. (ft) | 674.49 | Flow Area (sq ft) | | 65.22 | |
| E.G. Slope (ft/ft) | 0.018734 | Area (sq ft) | | 65.22 | |
| Q Total (cfs) | 362.10 | Flow (cfs) | | 362.10 | |
| Top Width (ft) | 69.74 | Top Width (ft) | | 69.74 | |
| Vel Total (ft/s) | 5.55 | Avg. Vel. (ft/s) | | 5.55 | |
| Max Chl Dpth (ft) | 1.59 | Hydr. Depth (ft) | | 0.94 | |
| Conv. Total (cfs) | 2645.6 | Conv. (cfs) | | 2645.6 | |

| | | | | | |
|---|---|---|---|---|---|
| Length Wtd. (ft) | 221.00 | Wetted Per. (ft) | | 69.85 | |
| Min Ch El (ft) | 672.90 | Shear (lb/sq ft) | | 1.09 | |
| Alpha | 1.00 | Stream Power (lb/ft s) | 600.00 | 0.00 | 0.00 |
| Frctn Loss (ft) | 4.18 | Cum Volume (acre-ft) | | 20.81 | |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | | 7.30 | |

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION

RIVER: Agua Hedionda
REACH: SM Highlands RS: 13

INPUT
Description:
Station Elevation Data num= 8

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 709.87 | 63.6 | 705 | 122.95 | 689.01 | 200.96 | 670 | 290.39 | 668.56 |
| 376.99 | 672 | 500.83 | 701.72 | 600 | 719.32 | | | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 0 | .03 | 122.95 | .035 | 500.83 | .03 |

| Bank Sta: Left | Right | Lengths: Left | Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|---|
| 122.95 | 500.83 | 200 | 200 | 200 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 670.72 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.47 | Wt. n-Val. | | 0.035 | |
| W.S. Elev (ft) | 670.24 | Reach Len. (ft) | 200.00 | 200.00 | 200.00 |
| Crit W.S. (ft) | 670.24 | Flow Area (sq ft) | | 122.03 | |
| E.G. Slope (ft/ft) | 0.019004 | Area (sq ft) | | 122.03 | |
| Q Total (cfs) | 674.70 | Flow (cfs) | | 674.70 | |
| Top Width (ft) | 132.83 | Top Width (ft) | | 132.83 | |
| Vel Total (ft/s) | 5.53 | Avg. Vel. (ft/s) | | 5.53 | |
| Max Chl Dpth (ft) | 1.68 | Hydr. Depth (ft) | | 0.92 | |
| Conv. Total (cfs) | 4894.3 | Conv. (cfs) | | 4894.3 | |
| Length Wtd. (ft) | 200.00 | Wetted Per. (ft) | | 132.90 | |
| Min Ch El (ft) | 668.56 | Shear (lb/sq ft) | | 1.09 | |
| Alpha | 1.00 | Stream Power (lb/ft s) | 600.00 | 0.00 | 0.00 |
| Frctn Loss (ft) | 0.84 | Cum Volume (acre-ft) | | 20.34 | |
| C & E Loss (ft) | 0.10 | Cum SA (acres) | | 6.78 | |

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION

RIVER: Agua Hedionda
REACH: SM Highlands RS: 12

INPUT
Description:
Station Elevation Data num= 11

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 707.64 | 39.3 | 700 | 88.81 | 686.43 | 153.24 | 674.83 | 203.44 | 670.05 |
| 229.59 | 666 | 314.09 | 663.29 | 367.99 | 669.93 | 428.54 | 688.61 | 504.8 | 705.92 |
| 600 | 715.97 | | | | | | | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 0 | .03 | 153.24 | .035 | 367.99 | .03 |

| Bank Sta: Left | Right | Lengths: Left | Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|---|
| 153.24 | 367.99 | 200 | 200 | 200 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 666.95 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.13 | Wt. n-Val. | | 0.035 | |
| W.S. Elev (ft) | 666.83 | Reach Len. (ft) | 200.00 | 200.00 | 200.00 |
| Crit W.S. (ft) | 665.64 | Flow Area (sq ft) | | 237.28 | |
| E.G. Slope (ft/ft) | 0.001785 | Area (sq ft) | | 237.28 | |
| Q Total (cfs) | 674.70 | Flow (cfs) | | 674.70 | |
| Top Width (ft) | 118.54 | Top Width (ft) | | 118.54 | |
| Vel Total (ft/s) | 2.84 | Avg. Vel. (ft/s) | | 2.84 | |
| Max Chl Dpth (ft) | 3.54 | Hydr. Depth (ft) | | 2.00 | |
| Conv. Total (cfs) | 15970.9 | Conv. (cfs) | | 15970.9 | |
| Length Wtd. (ft) | 200.00 | Wetted Per. (ft) | | 118.87 | |
| Min Ch El (ft) | 663.29 | Shear (lb/sq ft) | | 0.22 | |
| Alpha | 1.00 | Stream Power (lb/ft s) | 600.00 | 0.00 | 0.00 |
| Frctn Loss (ft) | 0.87 | Cum Volume (acre-ft) | | 19.51 | |
| C & E Loss (ft) | 0.04 | Cum SA (acres) | | 6.21 | |

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Agua Hedionda
REACH: SM Highlands RS: 11

INPUT
Description:
Station Elevation Data num= 11

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 707.64 | 86.22 | 687.22 | 164.31 | 674.29 | 204.06 | 670 | 229.59 | 666 |
| 313.1 | 663.29 | 341.94 | 665 | 369.82 | 670.46 | 428.54 | 688.61 | 508.15 | 706.43 |
| 600 | 715.97 | | | | | | | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 0 | .03 | 164.31 | .04 | 369.82 | .03 |

| Bank Sta: Left | Right | Lengths: Left | Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|---|
| 164.31 | 369.82 | 223 | 202 | 180 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 666.03 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.58 | Wt. n-Val. | | 0.040 | |
| W.S. Elev (ft) | 665.46 | Reach Len. (ft) | 223.00 | 202.00 | 180.00 |
| Crit W.S. (ft) | 665.46 | Flow Area (sq ft) | | 110.85 | |
| E.G. Slope (ft/ft) | 0.022816 | Area (sq ft) | | 110.85 | |
| Q Total (cfs) | 674.70 | Flow (cfs) | | 674.70 | |
| Top Width (ft) | 98.00 | Top Width (ft) | | 98.00 | |
| Vel Total (ft/s) | 6.09 | Avg. Vel. (ft/s) | | 6.09 | |
| Max Chl Dpth (ft) | 2.17 | Hydr. Depth (ft) | | 1.13 | |
| Conv. Total (cfs) | 4466.8 | Conv. (cfs) | | 4466.8 | |
| Length Wtd. (ft) | 202.00 | Wetted Per. (ft) | | 98.13 | |
| Min Ch El (ft) | 663.29 | Shear (lb/sq ft) | | 1.61 | |
| Alpha | 1.00 | Stream Power (lb/ft s) | 600.00 | 0.00 | 0.00 |
| Frctn Loss (ft) | 0.07 | Cum Volume (acre-ft) | | 18.71 | |
| C & E Loss (ft) | 0.17 | Cum SA (acres) | | 5.71 | |

Warning: The energy equation could not be balanced within the specified number of iterations.
The program used critical depth

for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION

RIVER: Agua Hedionda
REACH: SM Highlands RS: 10

INPUT
Description:
Station Elevation Data num= 9

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 7.61 | 699.57 | 33.88 | 691.15 | 109.68 | 675 | 156.53 | 668.82 | 229.75 | 656 |
| 360.07 | 656 | 425.32 | 674.44 | 486.5 | 688.78 | 600 | 689 | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 7.61 | .03 | 156.53 | .04 | 425.32 | .03 |

| Bank Sta: Left | Right | Lengths: Left | Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|---|
| 156.53 | 425.32 | 138 | 206 | 267 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 660.63 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.01 | Wt. n-Val. | | 0.040 | |
| W.S. Elev (ft) | 660.62 | Reach Len. (ft) | 138.00 | 206.00 | 267.00 |
| Crit W.S. (ft) | | Flow Area (sq ft) | | 699.99 | |
| E.G. Slope (ft/ft) | 0.000105 | Area (sq ft) | | 699.99 | |
| Q Total (cfs) | 674.70 | Flow (cfs) | | 674.70 | |
| Top Width (ft) | 173.01 | Top Width (ft) | | 173.01 | |
| Vel Total (ft/s) | 0.96 | Avg. Vel. (ft/s) | | 0.96 | |
| Max Chl Dpth (ft) | 4.62 | Hydr. Depth (ft) | | 4.05 | |
| Conv. Total (cfs) | 65761.3 | Conv. (cfs) | | 65761.3 | |
| Length Wtd. (ft) | 206.00 | Wetted Per. (ft) | | 174.05 | |
| Min Ch El (ft) | 656.00 | Shear (lb/sq ft) | | 0.03 | |
| Alpha | 1.00 | Stream Power (lb/ft s) | 600.00 | 0.00 | 0.00 |
| Frctn Loss (ft) | 0.02 | Cum Volume (acre-ft) | | 16.83 | |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | | 5.08 | |

CROSS SECTION

RIVER: Agua Hedionda
REACH: SM Highlands RS: 9

INPUT
Description:
Station Elevation Data num= 12

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 712.95 | 5.98 | 710 | 115.62 | 710 | 187.3 | 675 | 207.52 | 670 |
| 240.74 | 656 | 392.94 | 656 | 414.44 | 665 | 459 | 675.27 | 487.2 | 679.95 |
| 574.16 | 679.13 | 580.28 | 682 | | | | | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 0 | .03 | 187.3 | .04 | 459 | .03 |

| Bank Sta: Left | Right | Lengths: Left | Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|---|
| 187.3 | 459 | 144 | 202 | 677 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 660.61 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.01 | Wt. n-Val. | | 0.040 | |
| W.S. Elev (ft) | 660.60 | Reach Len. (ft) | 144.00 | 202.00 | 677.00 |
| Crit W.S. (ft) | | Flow Area (sq ft) | | 750.02 | |

| | | | | | |
|---|---|---|---|---|---|
| E.G. Slope (ft/ft) | 0.000085 | Area (sq ft) | | 750.02 | |
| Q Total (cfs) | 674.70 | Flow (cfs) | | 674.70 | |
| Top Width (ft) | 174.09 | Top Width (ft) | | 174.09 | |
| Vel Total (ft/s) | 0.90 | Avg. Vel. (ft/s) | | 0.90 | |
| Max Chl Dpth (ft) | 4.60 | Hydr. Depth (ft) | | 4.31 | |
| Conv. Total (cfs) | 73249.6 | Conv. (cfs) | | 73249.6 | |
| Length Wtd. (ft) | 202.00 | Wetted Per. (ft) | | 175.94 | |
| Min Ch El (ft) | 656.00 | Shear (lb/sq ft) | | 0.02 | |
| Alpha | 1.00 | Stream Power (lb/ft s) | 580.28 | 0.00 | 0.00 |
| Frctn Loss (ft) | 0.00 | Cum Volume (acre-ft) | | 13.40 | |
| C & E Loss (ft) | 0.00 | Cum SA (acres) | | 4.26 | |

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Agua Hedionda
REACH: SM Highlands RS: 8

INPUT
Description:
Station Elevation Data num= 14

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 710 | 89.94 | 710 | 137.54 | 684.23 | 188.84 | 670.63 | 237.78 | 655.63 |
| 345.23 | 646.36 | 394.69 | 655.76 | 429.46 | 656.43 | 451.45 | 663.15 | 482.96 | 662.26 |
| 515.68 | 665.79 | 526.53 | 668.84 | 538.31 | 669.65 | 581.5 | 670.03 | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 0 | .03 | 188.84 | .035 | 451.45 | .03 |

| Bank Sta: Left | Right | Lengths: Left | Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|---|
| 188.84 | 451.45 | 240 | 202 | 612 | .3 | .5 |

CROSS SECTION OUTPUT Profile #100 yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 660.60 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.00 | Wt. n-Val. | | 0.035 | |
| W.S. Elev (ft) | 660.60 | Reach Len. (ft) | 240.00 | 202.00 | 612.00 |
| Crit W.S. (ft) | 649.66 | Flow Area (sq ft) | | 1729.62 | |
| E.G. Slope (ft/ft) | 0.000006 | Area (sq ft) | | 1729.62 | |
| Q Total (cfs) | 674.70 | Flow (cfs) | | 674.70 | |
| Top Width (ft) | 221.55 | Top Width (ft) | | 221.55 | |
| Vel Total (ft/s) | 0.39 | Avg. Vel. (ft/s) | | 0.39 | |
| Max Chl Dpth (ft) | 14.24 | Hydr. Depth (ft) | | 7.81 | |
| Conv. Total (cfs) | 286688.6 | Conv. (cfs) | | 286688.6 | |
| Length Wtd. (ft) | 202.00 | Wetted Per. (ft) | | 224.21 | |
| Min Ch El (ft) | 646.36 | Shear (lb/sq ft) | | 0.00 | |
| Alpha | 1.00 | Stream Power (lb/ft s) | 581.50 | 0.00 | 0.00 |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | | 7.65 | |
| C & E Loss (ft) | | Cum SA (acres) | | 3.34 | |

CULVERT

RIVER: Agua Hedionda
REACH: SM Highlands RS: 7.5

INPUT
Description:
Distance from Upstream XS = 90
Deck/Roadway Width = 88
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 10

| Sta | Hi Cord | Lo Cord | Sta | Hi Cord | Lo Cord | Sta | Hi Cord | Lo Cord |
|---|---|---|---|---|---|---|---|---|
| 0 | 680 | | 89.94 | 675 | | 137.5 | 670 | |
| 189 | 669 | | 238 | 667 | | 310 | 663.82 | |
| 395 | 667 | | 429.5 | 669 | | 483 | 670 | |
| 600 | 675 | | | | | | | |

Upstream Bridge Cross Section Data
Station Elevation Data num= 14

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 710 | 89.94 | 710 | 137.54 | 684.23 | 188.84 | 670.63 | 237.78 | 655.63 |
| 345.23 | 646.36 | 394.69 | 655.76 | 429.46 | 656.43 | 451.45 | 663.15 | 482.96 | 662.26 |

```
  515.68  665.79  526.53  668.84  538.31  669.65   581.5  670.03

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .03  188.84    .035  451.45     .03

Bank Sta: Left   Right    Coeff Contr.   Expan.
        188.84  451.45             .3       .5

Downstream  Deck/Roadway Coordinates
    num=      10
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0     680           89.94     675           137.5     670
     189     669             238     667             310  663.82
     395     667           429.5     669             483     670
     600     675

Downstream Bridge Cross Section Data
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  688.21   68.13  676.53  189.82  665.81  203.13  659.96  302.09   636.8
  343.57  638.65  411.35  639.86  472.13  638.22  527.67  665.85  580.09  665.88

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .03  203.13    .035  527.67     .03

Bank Sta: Left   Right    Coeff Contr.   Expan.
        203.13  527.67             .3       .5

Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1      Circular       7
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 3 - Groove end entrance; pipe projecting from fill
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss
Coef
                90     102     .013     .013        0                   .5                1
Upstream   Elevation =  646.36
           Centerline Station =  345.23
Downstream Elevation =  636.8
           Centerline Station =  300

CULVERT OUTPUT  Profile #100 yr  Culv Group:  Culvert #1

  Q Culv Group (cfs)        674.70    Culv Full Len (ft)
  # Barrels                      1    Culv Vel US (ft/s)         17.53
  Q Barrel (cfs)            674.70    Culv Vel DS (ft/s)         31.40
  E.G. US. (ft)             660.60    Culv Inv El Up (ft)       646.36
  W.S. US. (ft)             660.60    Culv Inv El Dn (ft)       636.80
  E.G. DS (ft)              639.84    Culv Frctn Ls (ft)          2.28
  W.S. DS (ft)              639.38    Culv Exit Loss (ft)        16.09
  Delta EG (ft)              20.76    Culv Entr Loss (ft)         2.39
  Delta WS (ft)              21.22    Q Weir (cfs)
  E.G. IC (ft)              660.60    Weir Sta Lft (ft)
  E.G. OC (ft)              660.50    Weir Sta Rgt (ft)
  Culvert Control            Inlet    Weir Submerg
  Culv WS Inlet (ft)        653.36    Weir Max Depth (ft)
  Culv WS Outlet (ft)       640.62    Weir Avg Depth (ft)
  Culv Nml Depth (ft)         2.83    Weir Flow Area (sq ft)
  Culv Crt Depth (ft)         6.49    Min El Weir Flow (ft)     663.83


Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in
order to check if the cross section
         downstream of the culvert has supercritical flow.
Note:    The flow in the culvert is entirely supercritical.

CROSS SECTION
```

RIVER: Agua Hedionda
REACH: SM Highlands RS: 7

INPUT
Description:
Station Elevation Data num= 10

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 688.21 | 68.13 | 676.53 | 189.82 | 665.81 | 203.13 | 659.96 | 302.09 | 636.8 |
| 343.57 | 638.65 | 411.35 | 639.86 | 472.13 | 638.22 | 527.67 | 665.85 | 580.09 | 665.88 |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 0 | .03 | 203.13 | .035 | 527.67 | .03 |

| Bank Sta: Left | Right | Lengths: Left | Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|---|
| 203.13 | 527.67 | 299 | 226 | 141 | .3 | .5 |

CROSS SECTION OUTPUT Profile #100 yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 639.84 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.46 | Wt. n-Val. | | 0.035 | |
| W.S. Elev (ft) | 639.38 | Reach Len. (ft) | 299.00 | 226.00 | 141.00 |
| Crit W.S. (ft) | 639.38 | Flow Area (sq ft) | | 124.25 | |
| E.G. Slope (ft/ft) | 0.019084 | Area (sq ft) | | 124.25 | |
| Q Total (cfs) | 674.70 | Flow (cfs) | | 674.70 | |
| Top Width (ft) | 138.84 | Top Width (ft) | | 138.84 | |
| Vel Total (ft/s) | 5.43 | Avg. Vel. (ft/s) | | 5.43 | |
| Max Chl Dpth (ft) | 2.58 | Hydr. Depth (ft) | | 0.89 | |
| Conv. Total (cfs) | 4884.0 | Conv. (cfs) | | 4884.0 | |
| Length Wtd. (ft) | 226.00 | Wetted Per. (ft) | | 139.48 | |
| Min Ch El (ft) | 636.80 | Shear (lb/sq ft) | | 1.06 | |
| Alpha | 1.00 | Stream Power (lb/ft s) | 580.09 | 0.00 | 0.00 |
| Frctn Loss (ft) | 3.90 | Cum Volume (acre-ft) | | 3.94 | |
| C & E Loss (ft) | 0.09 | Cum SA (acres) | | 2.51 | |

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION

RIVER: Agua Hedionda
REACH: SM Highlands RS: 6

INPUT
Description:
Station Elevation Data num= 15

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 646.12 | 39.1 | 646.12 | 63.94 | 656.12 | 70.61 | 656.12 | 78.77 | 652.45 |
| 150.24 | 643.59 | 202.82 | 636.47 | 254.54 | 632 | 309.92 | 630.37 | 328.81 | 631.28 |
| 367.26 | 638.48 | 417.21 | 661.27 | 512.01 | 662.17 | 542.62 | 670.46 | 600 | 675.2 |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 0 | .03 | 150.24 | .035 | 367.26 | .03 |

| Bank Sta: Left | Right | Lengths: Left | Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|---|
| 150.24 | 367.26 | 114 | 296 | 522 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 633.51 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.75 | Wt. n-Val. | | 0.035 | |
| W.S. Elev (ft) | 632.76 | Reach Len. (ft) | 114.00 | 296.00 | 522.00 |
| Crit W.S. (ft) | 632.76 | Flow Area (sq ft) | | 133.31 | |
| E.G. Slope (ft/ft) | 0.016080 | Area (sq ft) | | 133.31 | |
| Q Total (cfs) | 924.00 | Flow (cfs) | | 924.00 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Top Width (ft) | 91.03 | Top Width (ft) | | | 91.03 | |
| Vel Total (ft/s) | 6.93 | Avg. Vel. (ft/s) | | | 6.93 | |
| Max Chl Dpth (ft) | 2.39 | Hydr. Depth (ft) | | | 1.46 | |
| Conv. Total (cfs) | 7286.6 | Conv. (cfs) | | | 7286.6 | |
| Length Wtd. (ft) | 296.00 | Wetted Per. (ft) | | | 91.25 | |
| Min Ch El (ft) | 630.37 | Shear (lb/sq ft) | | | 1.47 | |
| Alpha | 1.00 | Stream Power (lb/ft s) | 600.00 | | 0.00 | 0.00 |
| Frctn Loss (ft) | 4.64 | Cum Volume (acre-ft) | | | 3.27 | |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | | | 1.91 | |

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION

RIVER: Agua Hedionda
REACH: SM Highlands RS: 5

INPUT
Description:
Station Elevation Data num= 18

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 5.35 | 691 | 78.22 | 656.12 | 95.46 | 656.12 | 110.9 | 649.73 | 119.07 | 648.46 |
| 129.96 | 649.59 | 147.98 | 656.12 | 153.98 | 656.12 | 181.21 | 642.51 | 239.77 | 625 |
| 265.97 | 622 | 291.22 | 625.01 | 310.41 | 625.2 | 347.9 | 635 | 390.74 | 647.99 |
| 414.77 | 645.32 | 489.97 | 645.08 | 590.71 | 710.45 | | | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 5.35 | .03 | 181.21 | .035 | 390.74 | .03 |

| Bank Sta: Left | Right | Lengths: Left | Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|---|
| 181.21 | 390.74 | 249 | 202 | 154 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 yr

| | | | | | | |
|---|---|---|---|---|---|---|
| E.G. Elev (ft) | 626.54 | Element | Left OB | Channel | Right OB | |
| Vel Head (ft) | 0.84 | Wt. n-Val. | | 0.035 | | |
| W.S. Elev (ft) | 625.70 | Reach Len. (ft) | 249.00 | 202.00 | 154.00 | |
| Crit W.S. (ft) | 625.70 | Flow Area (sq ft) | | 125.46 | | |
| E.G. Slope (ft/ft) | 0.015259 | Area (sq ft) | | 125.46 | | |
| Q Total (cfs) | 924.00 | Flow (cfs) | | 924.00 | | |
| Top Width (ft) | 74.86 | Top Width (ft) | | 74.86 | | |
| Vel Total (ft/s) | 7.37 | Avg. Vel. (ft/s) | | 7.37 | | |
| Max Chl Dpth (ft) | 3.70 | Hydr. Depth (ft) | | 1.68 | | |
| Conv. Total (cfs) | 7480.1 | Conv. (cfs) | | 7480.1 | | |
| Length Wtd. (ft) | 202.00 | Wetted Per. (ft) | | 75.38 | | |
| Min Ch El (ft) | 622.00 | Shear (lb/sq ft) | | 1.59 | | |
| Alpha | 1.00 | Stream Power (lb/ft s) | 590.71 | 0.00 | 0.00 | |
| Frctn Loss (ft) | 3.12 | Cum Volume (acre-ft) | | 2.39 | | |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | | 1.35 | | |

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION

RIVER: Agua Hedionda
REACH: SM Highlands RS: 4

INPUT
Description:
Station Elevation Data num= 12

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 689 | 77.66 | 689 | 168.69 | 648.92 | 171.18 | 636.81 | 257.14 | 620 |
| 304.78 | 617.02 | 338.76 | 618 | 420.47 | 641.26 | 425.47 | 638.82 | 525.12 | 637.28 |
| 589.71 | 675.77 | 600 | 676.63 | | | | | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 0 | .03 | 171.18 | .035 | 420.47 | .03 |

| Bank Sta: Left | Right | Lengths: Left | Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|---|
| 171.18 | 420.47 | 262 | 206 | 149 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 620.40 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.81 | Wt. n-Val. | | 0.035 | |
| W.S. Elev (ft) | 619.59 | Reach Len. (ft) | 262.00 | 206.00 | 149.00 |
| Crit W.S. (ft) | 619.59 | Flow Area (sq ft) | | 128.14 | |
| E.G. Slope (ft/ft) | 0.015656 | Area (sq ft) | | 128.14 | |
| Q Total (cfs) | 924.00 | Flow (cfs) | | 924.00 | |
| Top Width (ft) | 80.71 | Top Width (ft) | | 80.71 | |
| Vel Total (ft/s) | 7.21 | Avg. Vel. (ft/s) | | 7.21 | |
| Max Chl Dpth (ft) | 2.57 | Hydr. Depth (ft) | | 1.59 | |
| Conv. Total (cfs) | 7384.8 | Conv. (cfs) | | 7384.8 | |
| Length Wtd. (ft) | 206.00 | Wetted Per. (ft) | | 81.02 | |
| Min Ch El (ft) | 617.02 | Shear (lb/sq ft) | | 1.55 | |
| Alpha | 1.00 | Stream Power (lb/ft s) | 600.00 | 0.00 | 0.00 |
| Frctn Loss (ft) | 3.12 | Cum Volume (acre-ft) | | 1.80 | |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | | 0.99 | |

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION

RIVER: Agua Hedionda
REACH: SM Highlands RS: 3

INPUT
Description:
Station Elevation Data num= 9

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 679.69 | 61.42 | 660.18 | 131.25 | 638.04 | 214.06 | 617.82 | 293.57 | 609.91 |
| 388.1 | 622.78 | 468.95 | 631.79 | 576.7 | 629.46 | 600 | 641.86 | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 0 | .03 | 131.25 | .035 | 388.1 | .03 |

| Bank Sta: Left | Right | Lengths: Left | Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|---|
| 131.25 | 388.1 | 399 | 240 | 89 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 614.54 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.93 | Wt. n-Val. | | 0.035 | |
| W.S. Elev (ft) | 613.62 | Reach Len. (ft) | 399.00 | 240.00 | 89.00 |
| Crit W.S. (ft) | 613.62 | Flow Area (sq ft) | | 119.50 | |
| E.G. Slope (ft/ft) | 0.014702 | Area (sq ft) | | 119.50 | |
| Q Total (cfs) | 924.00 | Flow (cfs) | | 924.00 | |
| Top Width (ft) | 64.48 | Top Width (ft) | | 64.48 | |
| Vel Total (ft/s) | 7.73 | Avg. Vel. (ft/s) | | 7.73 | |
| Max Chl Dpth (ft) | 3.71 | Hydr. Depth (ft) | | 1.85 | |
| Conv. Total (cfs) | 7620.5 | Conv. (cfs) | | 7620.5 | |
| Length Wtd. (ft) | 240.00 | Wetted Per. (ft) | | 64.92 | |
| Min Ch El (ft) | 609.91 | Shear (lb/sq ft) | | 1.69 | |

| | | | | | |
|---|---|---|---|---|---|
| Alpha | 1.00 | Stream Power (lb/ft s) | 600.00 | 0.00 | 0.00 |
| Frctn Loss (ft) | 3.53 | Cum Volume (acre-ft) | | 1.22 | |
| C & E Loss (ft) | 0.01 | Cum SA (acres) | | 0.64 | |

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION

RIVER: Agua Hedionda
REACH: SM Highlands RS: 2

INPUT
Description:
Station Elevation Data num= 14

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 659.48 | 18.83 | 658 | 70.32 | 662.82 | 138.41 | 661 | 194.46 | 633.27 |
| 247.88 | 610 | 293.92 | 605 | 299.01 | 603.51 | 335.08 | 609.99 | 414.94 | 620.39 |
| 447.36 | 626.37 | 542.94 | 625.5 | 563.04 | 638.46 | 600 | 642.32 | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 0 | .03 | 194.46 | .035 | 414.94 | .03 |

| Bank Sta: Left | Right | Lengths: Left | Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|---|
| 194.46 | 414.94 | 310 | 212 | 114 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 608.97 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 1.02 | Wt. n-Val. | | 0.035 | |
| W.S. Elev (ft) | 607.96 | Reach Len. (ft) | 310.00 | 212.00 | 114.00 |
| Crit W.S. (ft) | 607.96 | Flow Area (sq ft) | | 114.11 | |
| E.G. Slope (ft/ft) | 0.014699 | Area (sq ft) | | 114.11 | |
| Q Total (cfs) | 924.00 | Flow (cfs) | | 924.00 | |
| Top Width (ft) | 57.06 | Top Width (ft) | | 57.06 | |
| Vel Total (ft/s) | 8.10 | Avg. Vel. (ft/s) | | 8.10 | |
| Max Chl Dpth (ft) | 4.45 | Hydr. Depth (ft) | | 2.00 | |
| Conv. Total (cfs) | 7621.3 | Conv. (cfs) | | 7621.3 | |
| Length Wtd. (ft) | 212.00 | Wetted Per. (ft) | | 57.83 | |
| Min Ch El (ft) | 603.51 | Shear (lb/sq ft) | | 1.81 | |
| Alpha | 1.00 | Stream Power (lb/ft s) | 600.00 | 0.00 | 0.00 |
| Frctn Loss (ft) | 3.16 | Cum Volume (acre-ft) | | 0.57 | |
| C & E Loss (ft) | 0.04 | Cum SA (acres) | | 0.31 | |

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION

RIVER: Agua Hedionda
REACH: SM Highlands RS: 1

INPUT
Description:
Station Elevation Data num= 10

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 637.79 | 185.1 | 638.02 | 210.62 | 625 | 261.76 | 604.26 | 291.83 | 601.15 |
| 332.51 | 601 | 345.96 | 605 | 394.7 | 613.21 | 500.66 | 622 | 600 | 639.56 |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 0 | .03 | 210.62 | .035 | 394.7 | .03 |

| Bank Sta: Left | Right | Lengths: Left | Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|---|
| 210.62 | 394.7 | 0 | 0 | 0 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 yr

| | | | | | |
|---|---|---|---|---|---|
| E.G. Elev (ft) | 604.19 | Element | Left OB | Channel | Right OB |
| Vel Head (ft) | 0.89 | Wt. n-Val. | | 0.035 | |
| W.S. Elev (ft) | 603.30 | Reach Len. (ft) | | | |
| Crit W.S. (ft) | 603.30 | Flow Area (sq ft) | | 121.88 | |
| E.G. Slope (ft/ft) | 0.015127 | Area (sq ft) | | 121.88 | |
| Q Total (cfs) | 924.00 | Flow (cfs) | | 924.00 | |
| Top Width (ft) | 69.23 | Top Width (ft) | | 69.23 | |
| Vel Total (ft/s) | 7.58 | Avg. Vel. (ft/s) | | 7.58 | |
| Max Chl Dpth (ft) | 2.30 | Hydr. Depth (ft) | | 1.76 | |
| Conv. Total (cfs) | 7512.6 | Conv. (cfs) | | 7512.6 | |
| Length Wtd. (ft) | | Wetted Per. (ft) | | 69.67 | |
| Min Ch El (ft) | 601.00 | Shear (lb/sq ft) | | 1.65 | |
| Alpha | 1.00 | Stream Power (lb/ft s) | 600.00 | 0.00 | 0.00 |
| Frctn Loss (ft) | | Cum Volume (acre-ft) | | | |
| C & E Loss (ft) | | Cum SA (acres) | | | |

SUMMARY OF MANNING'S N VALUES

River:Agua Hedionda

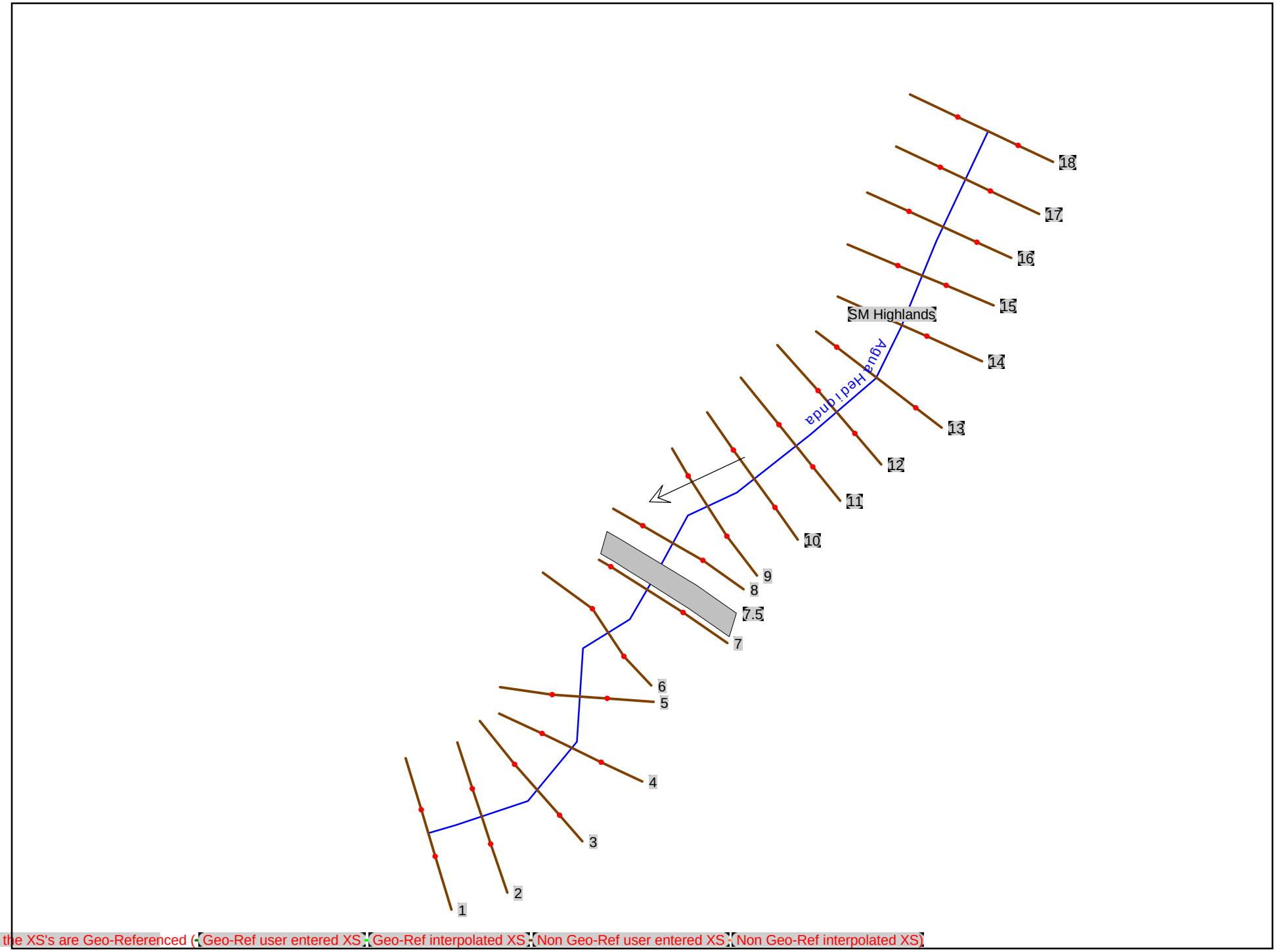
| Reach | River Sta. | n1 | n2 | n3 |
|---|---|---|---|---|
| SM Highlands | 18 | .03 | .035 | .03 |
| SM Highlands | 17 | .03 | .035 | .03 |
| SM Highlands | 16 | .03 | .035 | .03 |
| SM Highlands | 15 | .03 | .035 | .03 |
| SM Highlands | 14 | .03 | .035 | .03 |
| SM Highlands | 13 | .03 | .035 | .03 |
| SM Highlands | 12 | .03 | .035 | .03 |
| SM Highlands | 11 | .03 | .04 | .03 |
| SM Highlands | 10 | .03 | .04 | .03 |
| SM Highlands | 9 | .03 | .04 | .03 |
| SM Highlands | 8 | .03 | .035 | .03 |
| SM Highlands | 7.5 | Culvert | | |
| SM Highlands | 7 | .03 | .035 | .03 |
| SM Highlands | 6 | .03 | .035 | .03 |
| SM Highlands | 5 | .03 | .035 | .03 |
| SM Highlands | 4 | .03 | .035 | .03 |
| SM Highlands | 3 | .03 | .035 | .03 |
| SM Highlands | 2 | .03 | .035 | .03 |
| SM Highlands | 1 | .03 | .035 | .03 |

SUMMARY OF REACH LENGTHS

River: Agua Hedionda

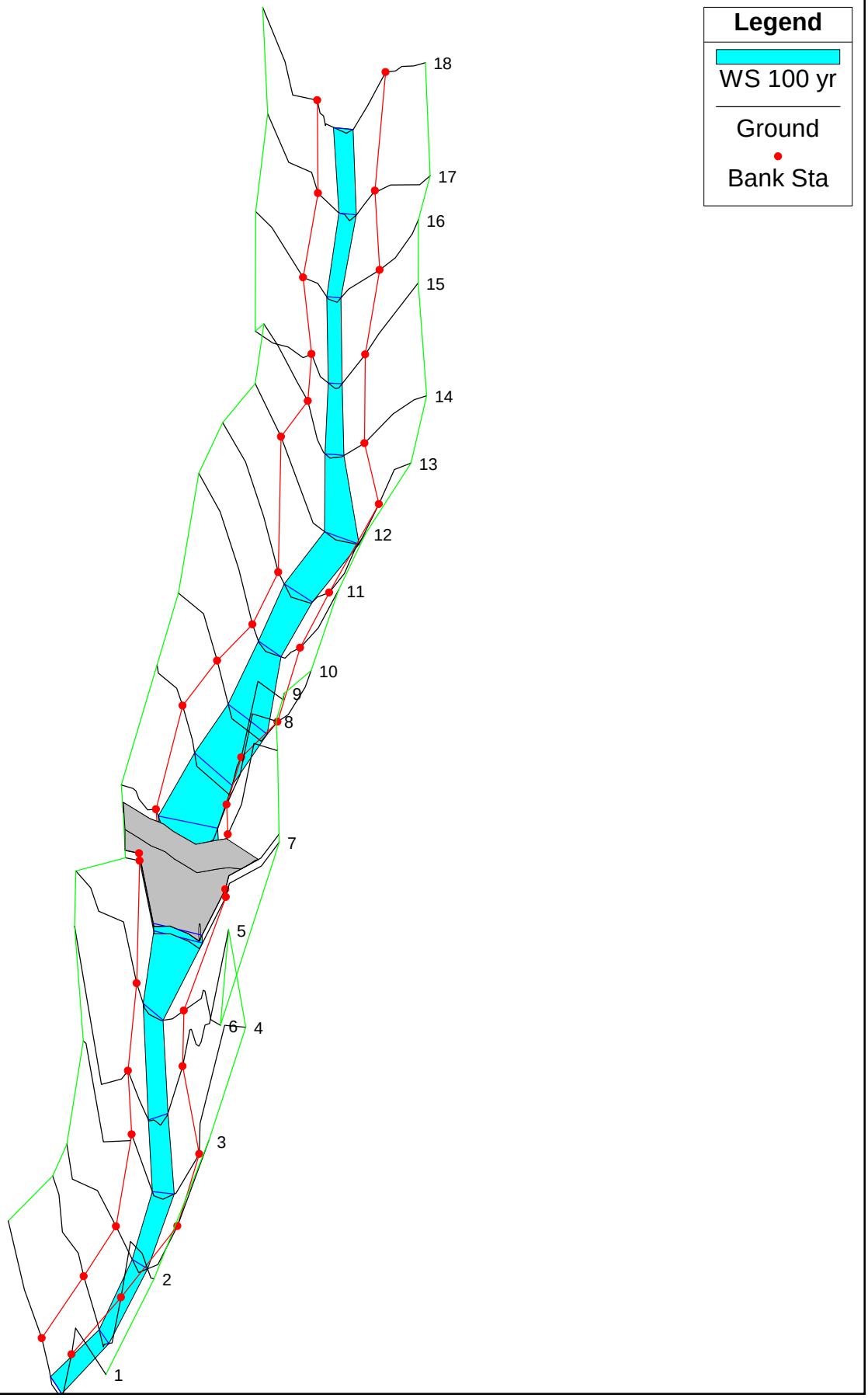
| Reach | River Sta. | Left | Channel | Right |
|---|---|---|---|---|
| SM Highlands | 18 | 251 | 201 | 149.5 |
| SM Highlands | 17 | 170 | 200 | 230 |
| SM Highlands | 16 | 201 | 201 | 201 |
| SM Highlands | 15 | 164 | 203 | 238 |
| SM Highlands | 14 | 336 | 221 | 89 |
| SM Highlands | 13 | 200 | 200 | 200 |
| SM Highlands | 12 | 200 | 200 | 200 |
| SM Highlands | 11 | 223 | 202 | 180 |
| SM Highlands | 10 | 138 | 206 | 267 |
| SM Highlands | 9 | 144 | 202 | 677 |
| SM Highlands | 8 | 240 | 202 | 612 |
| SM Highlands | 7.5 | Culvert | | |
| SM Highlands | 7 | 299 | 226 | 141 |
| SM Highlands | 6 | 114 | 296 | 522 |
| SM Highlands | 5 | 249 | 202 | 154 |
| SM Highlands | 4 | 262 | 206 | 149 |
| SM Highlands | 3 | 399 | 240 | 89 |

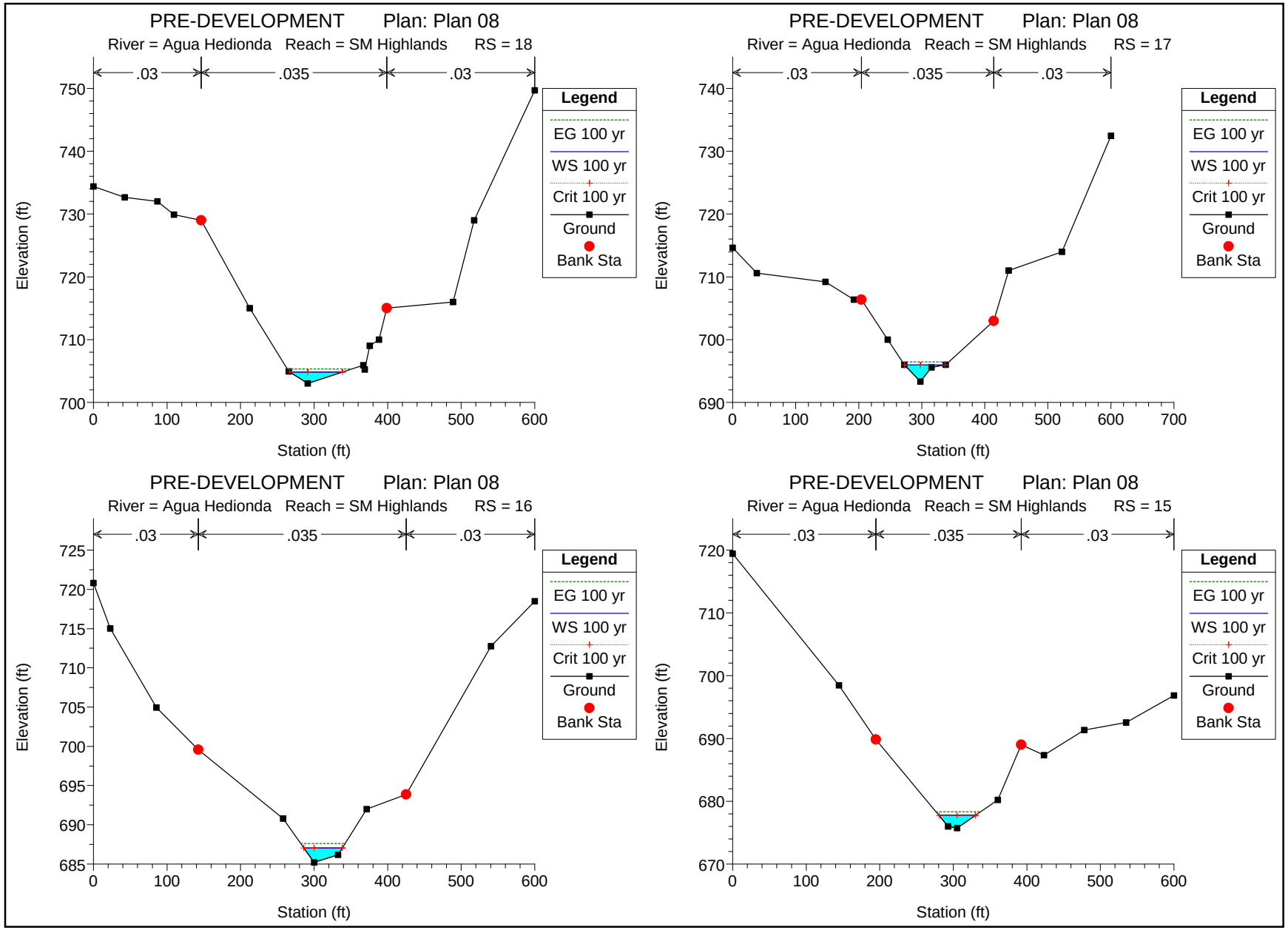
| | | | | |
|---|---|---|---|---|
| SM Highlands | 2 | 310 | 212 | 114 |
| SM Highlands | 1 | 0 | 0 | 0 |

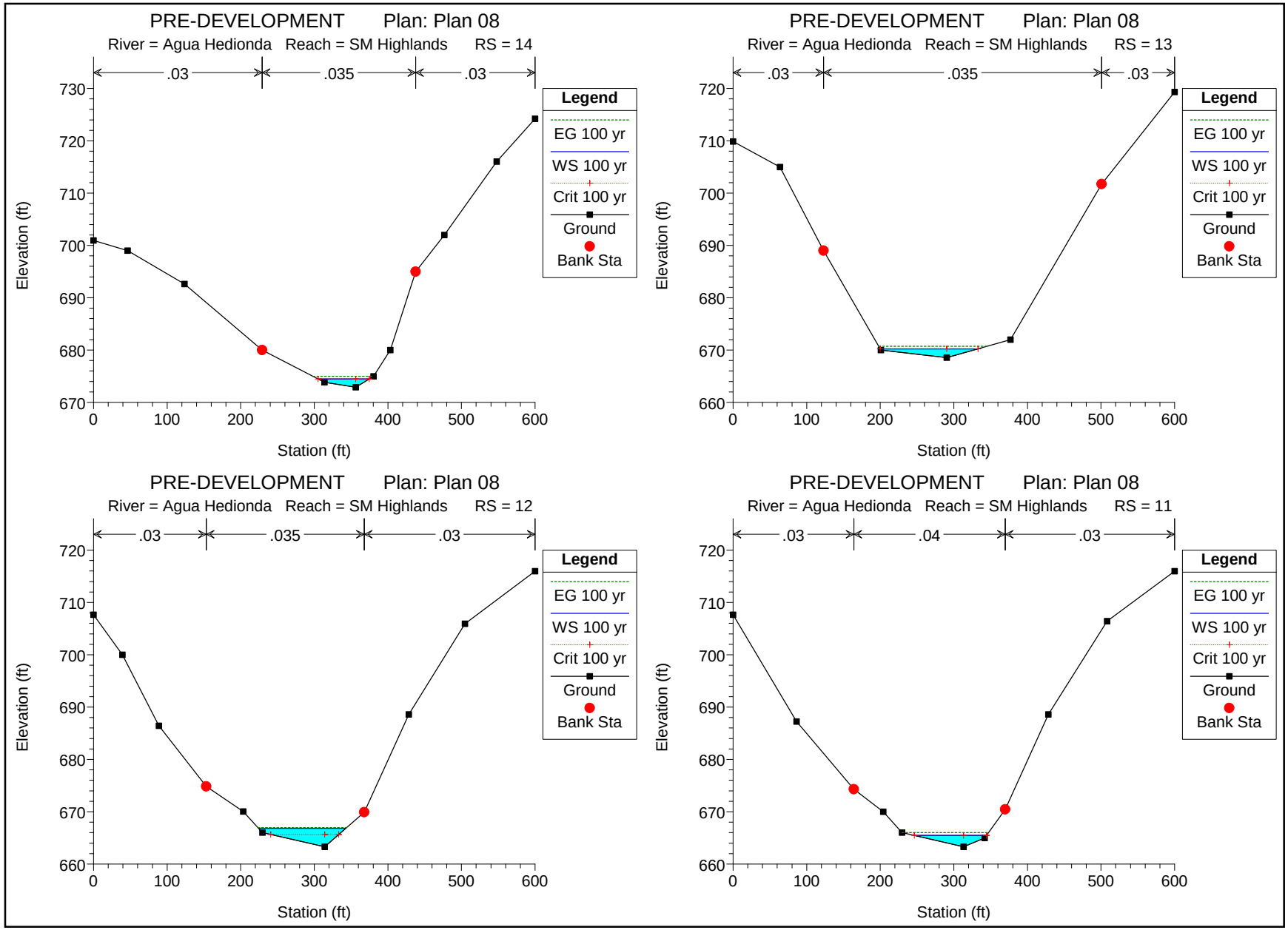

18
17
16
15
SM Highlands
14
Agua Hedionda
13
12
11
10
9
8
7.5
7
6
5
4
3
2
1
None of the XS's are Geo-Referenced (
Geo-Ref user entered XS
Geo-Ref interpolated XS
Non Geo-Ref user entered XS
Non Geo-Ref interpolated XS)

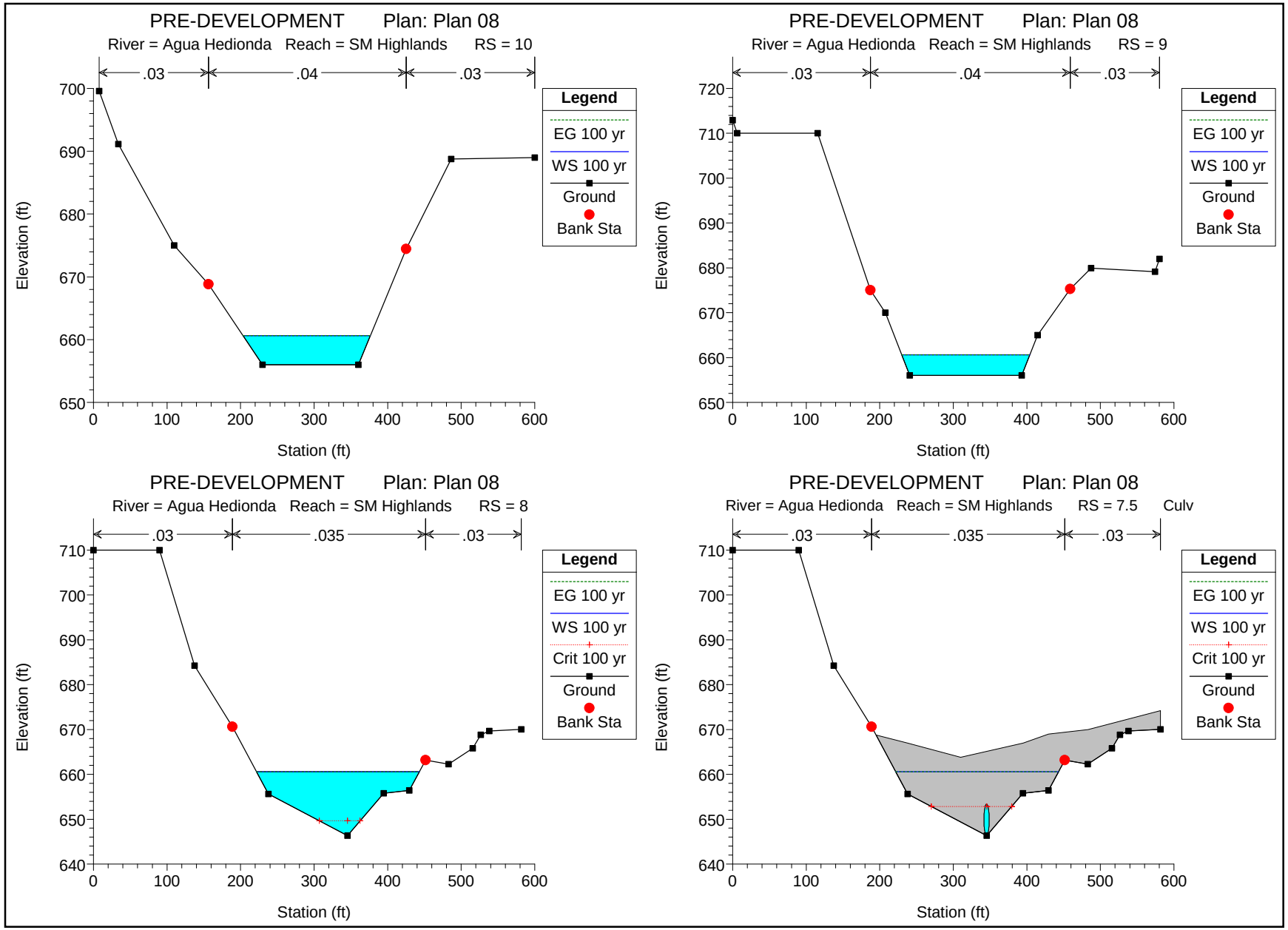
PRE-DEVELOPMENT Plan: Plan 07 2/19/2013

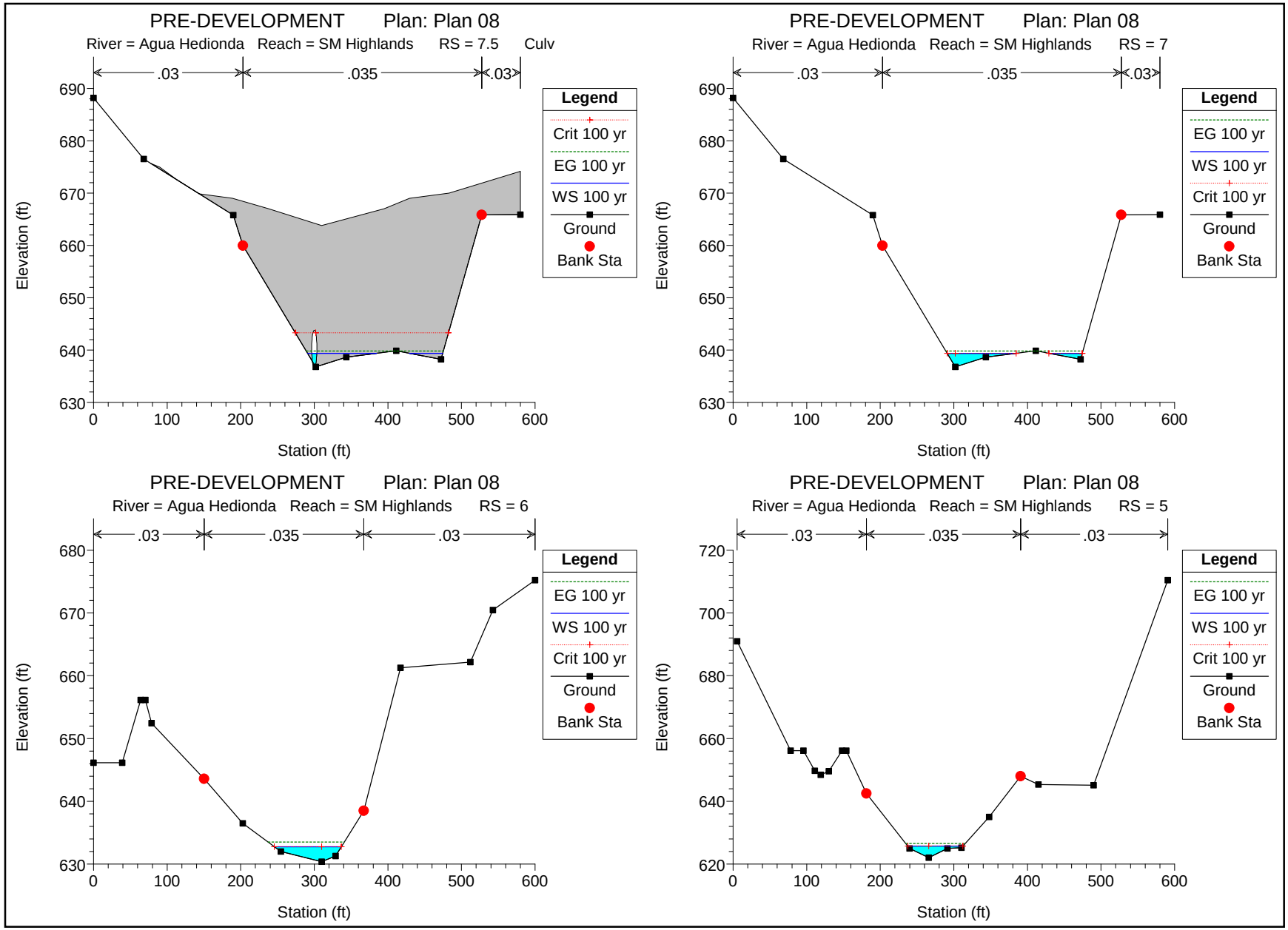
Geom: geo-post-dev Flow: pre-dev flow

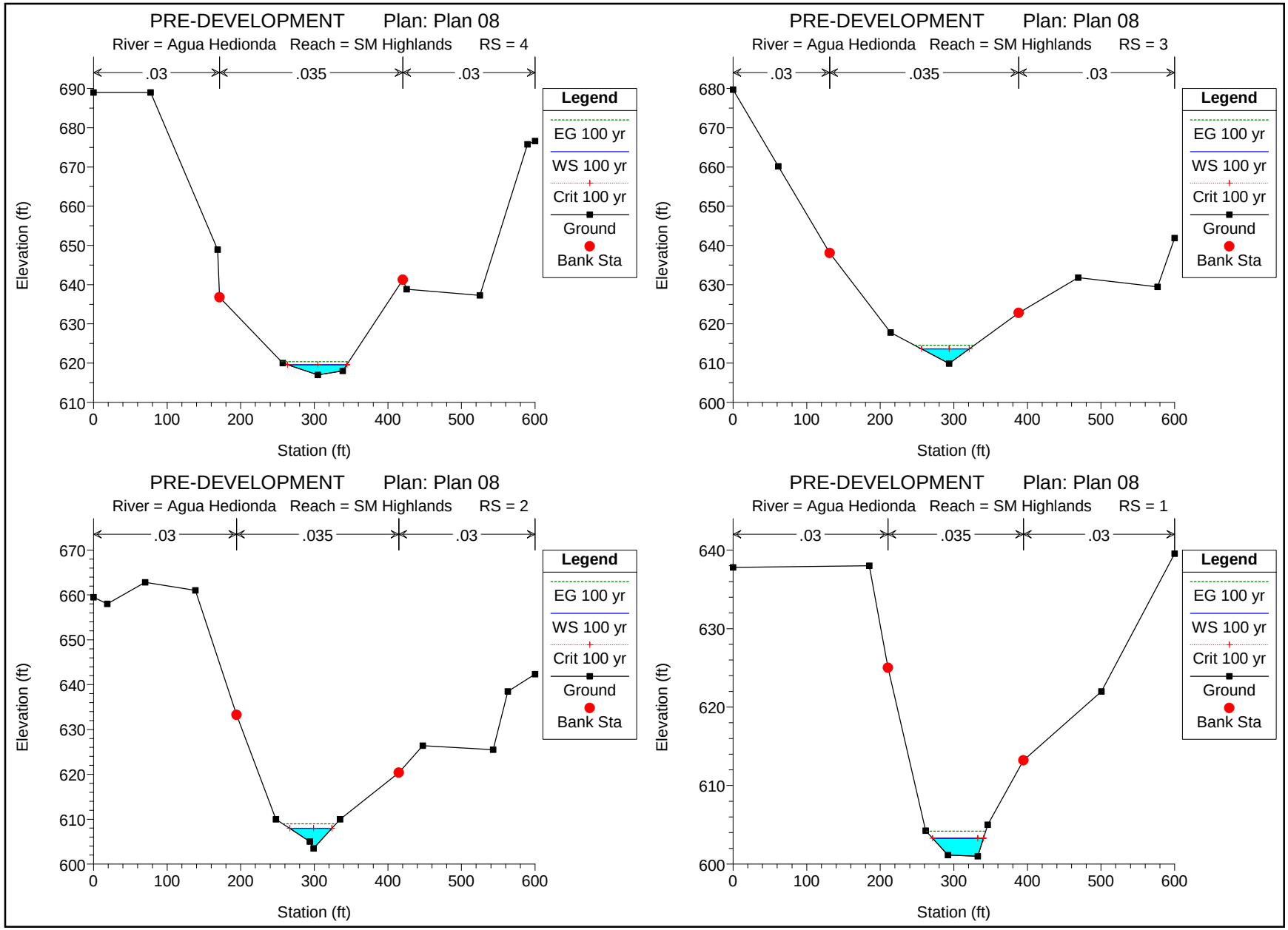



PRE-DEVELOPMENT Plan: Plan 08
River = Agua Hedionda Reach = SM Highlands RS = 18
.03 .035 .03
Elevation (ft)
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Bank Sta
PRE-DEVELOPMENT Plan: Plan 08
River = Agua Hedionda Reach = SM Highlands RS = 17
.03 .035 .03
Elevation (ft)
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Bank Sta
PRE-DEVELOPMENT Plan: Plan 08
River = Agua Hedionda Reach = SM Highlands RS = 16
.03 .035 .03
Elevation (ft)
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Bank Sta
PRE-DEVELOPMENT Plan: Plan 08
River = Agua Hedionda Reach = SM Highlands RS = 15
.03 .035 .03
Elevation (ft)
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Bank Sta


PRE-DEVELOPMENT Plan: Plan 08
River = Agua Hedionda Reach = SM Highlands RS = 14
.03
.035
.03
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
PRE-DEVELOPMENT Plan: Plan 08
River = Agua Hedionda Reach = SM Highlands RS = 13
.03
.035
.03
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
PRE-DEVELOPMENT Plan: Plan 08
River = Agua Hedionda Reach = SM Highlands RS = 12
.03
.035
.03
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
PRE-DEVELOPMENT Plan: Plan 08
River = Agua Hedionda Reach = SM Highlands RS = 11
.03
.04
.03
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)

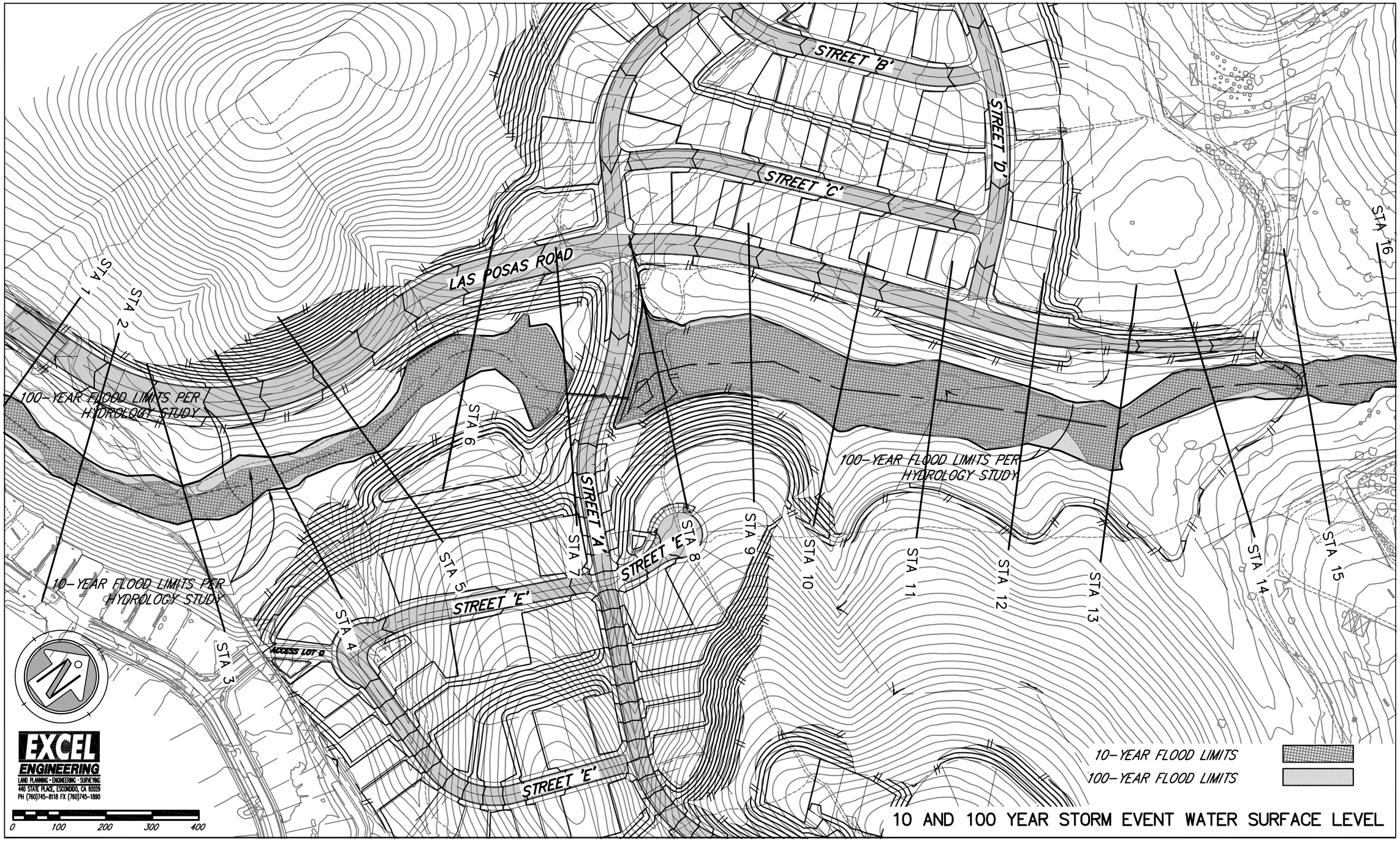

PRE-DEVELOPMENT Plan: Plan 08
River = Agua Hedionda Reach = SM Highlands RS = 10
.03 .04 .03
Legend
EG 100 yr
WS 100 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
PRE-DEVELOPMENT Plan: Plan 08
River = Agua Hedionda Reach = SM Highlands RS = 9
.03 .04 .03
Legend
EG 100 yr
WS 100 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
PRE-DEVELOPMENT Plan: Plan 08
River = Agua Hedionda Reach = SM Highlands RS = 8
.03 .035 .03
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
PRE-DEVELOPMENT Plan: Plan 08
River = Agua Hedionda Reach = SM Highlands RS = 7.5 Culv
.03 .035 .03
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


PRE-DEVELOPMENT Plan: Plan 08
River = Agua Hedionda Reach = SM Highlands RS = 7.5 Culv
.03
.035
.03
Legend
Crit 100 yr
EG 100 yr
WS 100 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
PRE-DEVELOPMENT Plan: Plan 08
River = Agua Hedionda Reach = SM Highlands RS = 7
.03
.035
.03
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
PRE-DEVELOPMENT Plan: Plan 08
River = Agua Hedionda Reach = SM Highlands RS = 6
.03
.035
.03
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
PRE-DEVELOPMENT Plan: Plan 08
River = Agua Hedionda Reach = SM Highlands RS = 5
.03
.035
.03
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


PRE-DEVELOPMENT Plan: Plan 08
River = Agua Hedionda Reach = SM Highlands RS = 4
.03
.035
.03
Elevation (ft)
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Bank Sta
PRE-DEVELOPMENT Plan: Plan 08
River = Agua Hedionda Reach = SM Highlands RS = 3
.03
.035
.03
Elevation (ft)
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Bank Sta
PRE-DEVELOPMENT Plan: Plan 08
River = Agua Hedionda Reach = SM Highlands RS = 2
.03
.035
.03
Elevation (ft)
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Bank Sta
PRE-DEVELOPMENT Plan: Plan 08
River = Agua Hedionda Reach = SM Highlands RS = 1
.03
.035
.03
Elevation (ft)
Station (ft)
Legend
EG 100 yr
WS 100 yr
Crit 100 yr
Ground
Bank Sta

HEC-RAS Plan: Plan 06 River: Agua Hedionda Reach: SM Highlands Profile: 100 yr

| Reach | River Sta | Profile | W.S. Elev |
|---|---|---|---|
| | | | (ft) |
| SM Highlands | 18 | 100 yr | 704.83 |
| SM Highlands | 17 | 100 yr | 695.96 |
| SM Highlands | 16 | 100 yr | 687.04 |
| SM Highlands | 15 | 100 yr | 677.80 |
| SM Highlands | 14 | 100 yr | 674.49 |
| SM Highlands | 13 | 100 yr | 670.24 |
| SM Highlands | 12 | 100 yr | 666.83 |
| SM Highlands | 11 | 100 yr | 665.45 |
| SM Highlands | 10 | 100 yr | 658.15 |
| SM Highlands | 9 | 100 yr | 657.79 |
| SM Highlands | 8 | 100 yr | 656.51 |
| SM Highlands | 7 | 100 yr | 638.85 |
| SM Highlands | 6 | 100 yr | 632.76 |
| SM Highlands | 5 | 100 yr | 625.70 |
| SM Highlands | 4 | 100 yr | 619.59 |
| SM Highlands | 3 | 100 yr | 613.62 |
| SM Highlands | 2 | 100 yr | 607.96 |
| SM Highlands | 1 | 100 yr | 603.30 |




10 AND 100 YEAR STORM EVENT WATER SURFACE LEVEL

HEC-RAS CALCULATION Agua Hedionda Profile: 10 yr

| Reach | River Sta | Profile | Q Total (cfs) | Min Ch El (ft) | W.S. Elev (ft) | Crit W.S. (ft) | E.G. Elev (ft) | E.G. Slope (ft/ft) | Vel Chnl (ft/s) | Flow Area (sq ft) | Top Width (ft) | Froude # Chl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SM Highlands | 18 | 100 yr | 362.1 | 703 | 704.83 | 704.83 | 705.3 | 0.018894 | 5.5 | 65.81 | 71.77 | 1.01 |
| SM Highlands | 17 | 100 yr | 362.1 | 693.33 | 695.96 | 695.96 | 696.46 | 0.01842 | 5.71 | 63.44 | 64.05 | 1.01 |
| SM Highlands | 16 | 100 yr | 362.1 | 685.21 | 687.04 | 687.04 | 687.62 | 0.017607 | 6.1 | 59.32 | 52.4 | 1.01 |
| SM Highlands | 15 | 100 yr | 362.1 | 675.72 | 677.8 | 677.73 | 678.33 | 0.014611 | 5.85 | 61.94 | 50.72 | 0.93 |
| SM Highlands | 14 | 100 yr | 362.1 | 672.9 | 674.49 | 674.49 | 674.97 | 0.018734 | 5.55 | 65.22 | 69.74 | 1.01 |
| SM Highlands | 13 | 100 yr | 674.7 | 668.56 | 670.24 | 670.24 | 670.72 | 0.019004 | 5.53 | 122.03 | 132.83 | 1.02 |
| SM Highlands | 12 | 100 yr | 674.7 | 663.29 | 666.83 | 665.64 | 666.95 | 0.001785 | 2.84 | 237.28 | 118.54 | 0.35 |
| SM Highlands | 11 | 100 yr | 674.7 | 663.29 | 665.46 | 665.46 | 666.03 | 0.022816 | 6.09 | 110.85 | 98 | 1.01 |
| SM Highlands | 10 | 100 yr | 674.7 | 656 | 660.62 | | 660.63 | 0.000105 | 0.96 | 699.99 | 173.01 | 0.08 |
| SM Highlands | 9 | 100 yr | 674.7 | 656 | 660.6 | | 660.61 | 0.000085 | 0.9 | 750.02 | 174.09 | 0.08 |
| SM Highlands | 8 | 100 yr | 674.7 | 646.36 | 660.6 | 649.66 | 660.6 | 0.000006 | 0.39 | 1729.62 | 221.55 | 0.02 |
| SM Highlands | 7.5 | | Culvert | | | | | | | | | |
| SM Highlands | 7 | 100 yr | 674.7 | 636.8 | 639.38 | 639.38 | 639.84 | 0.019084 | 5.43 | 124.25 | 138.84 | 1.01 |
| SM Highlands | 6 | 100 yr | 924 | 630.37 | 632.76 | 632.76 | 633.51 | 0.01608 | 6.93 | 133.31 | 91.03 | 1.01 |
| SM Highlands | 5 | 100 yr | 924 | 622 | 625.7 | 625.7 | 626.54 | 0.015259 | 7.37 | 125.46 | 74.86 | 1 |
| SM Highlands | 4 | 100 yr | 924 | 617.02 | 619.59 | 619.59 | 620.4 | 0.015656 | 7.21 | 128.14 | 80.71 | 1.01 |
| SM Highlands | 3 | 100 yr | 924 | 609.91 | 613.62 | 613.62 | 614.54 | 0.014702 | 7.73 | 119.5 | 64.48 | 1 |
| SM Highlands | 2 | 100 yr | 924 | 603.51 | 607.96 | 607.96 | 608.97 | 0.014699 | 8.1 | 114.11 | 57.06 | 1.01 |
| SM Highlands | 1 | 100 yr | 924 | 601 | 603.3 | 603.3 | 604.19 | 0.015127 | 7.58 | 121.88 | 69.23 | 1.01 |

```
                    HEC-RAS Version 4.1.0 Jan 2010
                     U.S. Army Corps of Engineers
                    Hydrologic Engineering Center
                          609 Second Street
                          Davis, California


            X     X  XXXXXX    XXXX        XXXX       XX      XXXX
            X     X  X        X    X       X   X     X  X    X
            X     X  X        X            X   X    X    X   X
            XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
            X     X  X        X            X  X     X    X        X
            X     X  X        X    X       X   X    X    X        X
            X     X  XXXXXX    XXXX        X    X   X    X   XXXXX


PROJECT DATA
Project Title: PRE-DEVELOPMENT
Project File : PRE-DEVELOPMENT.prj
Run Date and Time: 3/27/2013 1:00:41 PM

Project in English units


PLAN DATA

Plan Title: Plan 08
Plan File : q:\12\12052\TM\TM1\HYD\HECRAS\CROSS SECTION\PRE-
DEVELOPMENT.p08

           Geometry Title: geo-post-dev
           Geometry File : q:\12\12052\TM\TM1\HYD\HECRAS\CROSS
SECTION\PRE-DEVELOPMENT.g02

           Flow Title    : pre-dev flow
           Flow File     : q:\12\12052\TM\TM1\HYD\HECRAS\CROSS
SECTION\PRE-DEVELOPMENT.f01

Plan Summary Information:
Number of:  Cross Sections =   18    Multiple Openings  =    0
            Culverts       =    1    Inline Structures  =    0
            Bridges        =    0    Lateral Structures =    0

Computational Information
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
```

Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: pre-dev flow
Flow File : q:\12\12052\TM\TM1\HYD\HECRAS\CROSS SECTION\PRE-DEVELOPMENT.f01

Flow Data (cfs)

| River | Reach | RS | 100 yr |
|---|---|---|---|
| Agua Hedionda | SM Highlands | 18 | 362.1 |
| Agua Hedionda | SM Highlands | 13 | 674.7 |
| Agua Hedionda | SM Highlands | 6 | 924 |

Boundary Conditions

| River | Reach | Profile | Upstream | Downstream |
|---|---|---|---|---|
| Agua Hedionda | SM Highlands | 100 yr | | Critical |

GEOMETRY DATA

Geometry Title: geo-post-dev
Geometry File : q:\12\12052\TM\TM1\HYD\HECRAS\CROSS SECTION\PRE-DEVELOPMENT.g02

CROSS SECTION

RIVER: Agua Hedionda
REACH: SM Highlands RS: 18

INPUT
Description:
Station Elevation Data num= 16

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 734.4 | 42.56 | 732.64 | 87 | 732 | 109.57 | 729.92 | 146.3 | 729 |
| 212.31 | 715 | 265.43 | 704.95 | 291.31 | 703 | 367.1 | 705.93 | 368.78 | 705.24 |
| 375.71 | 709 | 388.24 | 710 | 398.89 | 715 | 489.05 | 716 | 517.58 | 729 |
| 600 | 749.7 | | | | | | | | |

```
Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .03   146.3    .035  398.89     .03

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
         146.3  398.89              251     201   149.5             .1
.3

CROSS SECTION OUTPUT  Profile #100 yr

  E.G. Elev (ft)            705.30    Element                   Left OB
Channel   Right OB
  Vel Head (ft)               0.47    Wt. n-Val.
0.035
  W.S. Elev (ft)            704.83    Reach Len. (ft)           251.00
201.00     149.50
  Crit W.S. (ft)            704.83    Flow Area (sq ft)
65.81
  E.G. Slope (ft/ft)      0.018894    Area (sq ft)
65.81
  Q Total (cfs)             362.10    Flow (cfs)
362.10
  Top Width (ft)             71.77    Top Width (ft)
71.77
  Vel Total (ft/s)            5.50    Avg. Vel. (ft/s)
5.50
  Max Chl Dpth (ft)           1.83    Hydr. Depth (ft)
0.92
  Conv. Total (cfs)         2634.3    Conv. (cfs)
2634.3
  Length Wtd. (ft)          201.00    Wetted Per. (ft)
71.88
  Min Ch El (ft)            703.00    Shear (lb/sq ft)
1.08
  Alpha                       1.00    Stream Power (lb/ft s)    600.00
0.00       0.00
  Frctn Loss (ft)             3.75    Cum Volume (acre-ft)
21.97
  C & E Loss (ft)             0.00    Cum SA (acres)
8.40


Warning: The energy equation could not be balanced within the specified
number of iterations.  The program used critical depth
         for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the
current and previous cross section.  This may indicate the
         need for additional cross sections.
Warning: During the standard step iterations, when the assumed water
surface was set equal to critical depth, the calculated
         water surface came back below critical depth.  This indicates
that there is not a valid subcritical answer.  The program
```

```
         defaulted to critical depth.

CROSS SECTION


RIVER: Agua Hedionda
REACH: SM Highlands       RS: 17

INPUT
Description:
Station Elevation Data    num=      14
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0  714.61   38.49  710.59  147.06   709.2  192.29  706.35  204.23
706.36
  246.05     700  272.27     696   297.8  693.33   315.3  695.57  338.11
695.98
  414.27  702.97   437.9  711.01  522.35  713.98  600.01  732.47

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .03  204.23    .035  414.27     .03

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
        204.23  414.27              170     200     230             .1
.3

CROSS SECTION OUTPUT  Profile #100 yr

  E.G. Elev (ft)            696.46    Element                    Left OB
Channel   Right OB
  Vel Head (ft)               0.51    Wt. n-Val.
0.035
  W.S. Elev (ft)            695.96    Reach Len. (ft)           170.00
200.00     230.00
  Crit W.S. (ft)            695.96    Flow Area (sq ft)
63.44
  E.G. Slope (ft/ft)      0.018420    Area (sq ft)
63.44
  Q Total (cfs)             362.10    Flow (cfs)
362.10
  Top Width (ft)             64.05    Top Width (ft)
64.05
  Vel Total (ft/s)            5.71    Avg. Vel. (ft/s)
5.71
  Max Chl Dpth (ft)           2.63    Hydr. Depth (ft)
0.99
  Conv. Total (cfs)         2668.0    Conv. (cfs)
2668.0
  Length Wtd. (ft)          200.00    Wetted Per. (ft)
64.34
  Min Ch El (ft)            693.33    Shear (lb/sq ft)
1.13
```

```
  Alpha                        1.00    Stream Power (lb/ft s)    600.01
0.00       0.00
  Frctn Loss (ft)              3.60    Cum Volume (acre-ft)
21.67
  C & E Loss (ft)              0.01    Cum SA (acres)
8.08


Warning: The energy equation could not be balanced within the specified
number of iterations.  The program used critical depth
         for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the
current and previous cross section.  This may indicate the
         need for additional cross sections.
Warning: During the standard step iterations, when the assumed water
surface was set equal to critical depth, the calculated
         water surface came back below critical depth.  This indicates
that there is not a valid subcritical answer.  The program
         defaulted to critical depth.

CROSS SECTION


RIVER: Agua Hedionda
REACH: SM Highlands       RS: 16

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0   720.8   22.87     715   85.69  704.95  142.68  699.56   257.7
690.78
  299.85  685.21   332.6  686.18  371.62     692  425.35  693.86   540.3
712.74
     600  718.48

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .03  142.68    .035  425.35     .03

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
        142.68  425.35              201     201     201             .1
.3

CROSS SECTION OUTPUT  Profile #100 yr

  E.G. Elev (ft)            687.62    Element                    Left OB
Channel   Right OB
  Vel Head (ft)               0.58    Wt. n-Val.
0.035
  W.S. Elev (ft)            687.04    Reach Len. (ft)           201.00
201.00     201.00
```

```
  Crit W.S. (ft)            687.04    Flow Area (sq ft)
59.32
  E.G. Slope (ft/ft)      0.017607    Area (sq ft)
59.32
  Q Total (cfs)             362.10    Flow (cfs)
362.10
  Top Width (ft)             52.40    Top Width (ft)
52.40
  Vel Total (ft/s)            6.10    Avg. Vel. (ft/s)
6.10
  Max Chl Dpth (ft)           1.83    Hydr. Depth (ft)
1.13
  Conv. Total (cfs)         2728.9    Conv. (cfs)
2728.9
  Length Wtd. (ft)          201.00    Wetted Per. (ft)
52.60
  Min Ch El (ft)            685.21    Shear (lb/sq ft)
1.24
  Alpha                       1.00    Stream Power (lb/ft s)    600.00
0.00       0.00
  Frctn Loss (ft)             3.22    Cum Volume (acre-ft)
21.39
  C & E Loss (ft)             0.01    Cum SA (acres)
7.81


Warning: The energy equation could not be balanced within the specified
number of iterations.  The program used critical depth
         for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the
current and previous cross section.  This may indicate the
         need for additional cross sections.
Warning: During the standard step iterations, when the assumed water
surface was set equal to critical depth, the calculated
         water surface came back below critical depth.  This indicates
that there is not a valid subcritical answer.  The program
         defaulted to critical depth.

CROSS SECTION


RIVER: Agua Hedionda
REACH: SM Highlands       RS: 15

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0  719.45  144.68  698.46  194.72  689.85  292.93     676  305.15
675.72
  360.63   680.2   392.5     689   423.4  687.33   477.9  691.35  534.95
692.56
     600  696.86
```

```
Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .03  194.72    .035   392.5     .03

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
        194.72   392.5              164     203     238             .1
.3

CROSS SECTION OUTPUT  Profile #100 yr

  E.G. Elev (ft)            678.33    Element                   Left OB
Channel   Right OB
  Vel Head (ft)               0.53    Wt. n-Val.
0.035
  W.S. Elev (ft)            677.80    Reach Len. (ft)           164.00
203.00     238.00
  Crit W.S. (ft)            677.73    Flow Area (sq ft)
61.94
  E.G. Slope (ft/ft)      0.014611    Area (sq ft)
61.94
  Q Total (cfs)             362.10    Flow (cfs)
362.10
  Top Width (ft)             50.72    Top Width (ft)
50.72
  Vel Total (ft/s)            5.85    Avg. Vel. (ft/s)
5.85
  Max Chl Dpth (ft)           2.08    Hydr. Depth (ft)
1.22
  Conv. Total (cfs)         2995.6    Conv. (cfs)
2995.6
  Length Wtd. (ft)          203.00    Wetted Per. (ft)
50.94
  Min Ch El (ft)            675.72    Shear (lb/sq ft)
1.11
  Alpha                       1.00    Stream Power (lb/ft s)    600.00
0.00       0.00
  Frctn Loss (ft)             3.35    Cum Volume (acre-ft)
21.11
  C & E Loss (ft)             0.02    Cum SA (acres)
7.58


Warning: The energy loss was greater than 1.0 ft (0.3 m). between the
current and previous cross section.  This may indicate the
         need for additional cross sections.

CROSS SECTION


RIVER: Agua Hedionda
REACH: SM Highlands       RS: 14
```

```
INPUT
Description:
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0  700.97   46.34  698.99  123.59  692.64  229.32     680  313.98
673.84
  356.38   672.9  380.56     675  403.47     680   437.9     695   476.6
702
  547.73     716     600  724.22

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .03  229.32    .035   437.9     .03

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
        229.32   437.9              336     221      89             .1
.3

CROSS SECTION OUTPUT  Profile #100 yr

  E.G. Elev (ft)            674.97    Element                    Left OB
Channel   Right OB
  Vel Head (ft)               0.48    Wt. n-Val.
0.035
  W.S. Elev (ft)            674.49    Reach Len. (ft)           336.00
221.00      89.00
  Crit W.S. (ft)            674.49    Flow Area (sq ft)
65.22
  E.G. Slope (ft/ft)      0.018734    Area (sq ft)
65.22
  Q Total (cfs)             362.10    Flow (cfs)
362.10
  Top Width (ft)             69.74    Top Width (ft)
69.74
  Vel Total (ft/s)            5.55    Avg. Vel. (ft/s)
5.55
  Max Chl Dpth (ft)           1.59    Hydr. Depth (ft)
0.94
  Conv. Total (cfs)         2645.6    Conv. (cfs)
2645.6
  Length Wtd. (ft)          221.00    Wetted Per. (ft)
69.85
  Min Ch El (ft)            672.90    Shear (lb/sq ft)
1.09
  Alpha                       1.00    Stream Power (lb/ft s)    600.00
0.00       0.00
  Frctn Loss (ft)             4.18    Cum Volume (acre-ft)
20.81
  C & E Loss (ft)             0.00    Cum SA (acres)
7.30
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION

RIVER: Agua Hedionda
REACH: SM Highlands RS: 13

INPUT
Description:
Station Elevation Data num= 8

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 709.87 | 63.6 | 705 | 122.95 | 689.01 | 200.96 | 670 | 290.39 | 668.56 |
| 376.99 | 672 | 500.83 | 701.72 | 600 | 719.32 | | | | |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 0 | .03 | 122.95 | .035 | 500.83 | .03 |

| Bank Sta: Left | Right | Lengths: Left | Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|---|
| 122.95 | 500.83 | 200 | 200 | 200 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 yr

| | | | | | | |
|---|---|---|---|---|---|---|
| E.G. Elev (ft) | 670.72 | Element | Left OB | Channel | Right OB | |
| Vel Head (ft) | 0.47 | Wt. n-Val. | | | | 0.035 |
| W.S. Elev (ft) | 670.24 | Reach Len. (ft) | 200.00 | 200.00 | 200.00 | |
| Crit W.S. (ft) | 670.24 | Flow Area (sq ft) | | | | 122.03 |
| E.G. Slope (ft/ft) | 0.019004 | Area (sq ft) | | | | 122.03 |
| Q Total (cfs) | 674.70 | Flow (cfs) | | | | 674.70 |

```
  Top Width (ft)            132.83    Top Width (ft)
132.83
  Vel Total (ft/s)            5.53    Avg. Vel. (ft/s)
5.53
  Max Chl Dpth (ft)           1.68    Hydr. Depth (ft)
0.92
  Conv. Total (cfs)         4894.3    Conv. (cfs)
4894.3
  Length Wtd. (ft)          200.00    Wetted Per. (ft)
132.90
  Min Ch El (ft)            668.56    Shear (lb/sq ft)
1.09
  Alpha                       1.00    Stream Power (lb/ft s)    600.00
0.00       0.00
  Frctn Loss (ft)             0.84    Cum Volume (acre-ft)
20.34
  C & E Loss (ft)             0.10    Cum SA (acres)
6.78


Warning: The energy equation could not be balanced within the specified
number of iterations.  The program used critical depth
         for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream
conveyance) is less than 0.7 or greater than 1.4.
          This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the
current and previous cross section.  This may indicate the
         need for additional cross sections.
Warning: During the standard step iterations, when the assumed water
surface was set equal to critical depth, the calculated
         water surface came back below critical depth.  This indicates
that there is not a valid subcritical answer.  The program
         defaulted to critical depth.

CROSS SECTION


RIVER: Agua Hedionda
REACH: SM Highlands       RS: 12

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0  707.64    39.3     700   88.81  686.43  153.24  674.83  203.44
670.05
  229.59     666  314.09  663.29  367.99  669.93  428.54  688.61   504.8
705.92
     600  715.97

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
```

```
       0     .03  153.24    .035  367.99     .03

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
        153.24  367.99              200     200     200             .1
.3

CROSS SECTION OUTPUT  Profile #100 yr

  E.G. Elev (ft)            666.95    Element                    Left OB
Channel   Right OB
  Vel Head (ft)               0.13    Wt. n-Val.
0.035
  W.S. Elev (ft)            666.83    Reach Len. (ft)           200.00
200.00     200.00
  Crit W.S. (ft)            665.64    Flow Area (sq ft)
237.28
  E.G. Slope (ft/ft)      0.001785    Area (sq ft)
237.28
  Q Total (cfs)             674.70    Flow (cfs)
674.70
  Top Width (ft)            118.54    Top Width (ft)
118.54
  Vel Total (ft/s)            2.84    Avg. Vel. (ft/s)
2.84
  Max Chl Dpth (ft)           3.54    Hydr. Depth (ft)
2.00
  Conv. Total (cfs)        15970.9    Conv. (cfs)
15970.9
  Length Wtd. (ft)          200.00    Wetted Per. (ft)
118.87
  Min Ch El (ft)            663.29    Shear (lb/sq ft)
0.22
  Alpha                       1.00    Stream Power (lb/ft s)    600.00
0.00       0.00
  Frctn Loss (ft)             0.87    Cum Volume (acre-ft)
19.51
  C & E Loss (ft)             0.04    Cum SA (acres)
6.21


Warning: The conveyance ratio (upstream conveyance divided by downstream
conveyance) is less than 0.7 or greater than 1.4.
          This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: Agua Hedionda
REACH: SM Highlands       RS: 11

INPUT
Description:
Station Elevation Data    num=      11
```

```
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0  707.64   86.22  687.22  164.31  674.29  204.06     670  229.59
666
   313.1  663.29  341.94     665  369.82  670.46  428.54  688.61  508.15
706.43
     600  715.97

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .03  164.31     .04  369.82     .03

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
        164.31  369.82              223     202     180             .1
.3

CROSS SECTION OUTPUT  Profile #100 yr

  E.G. Elev (ft)            666.03    Element                   Left OB
Channel   Right OB
  Vel Head (ft)               0.58    Wt. n-Val.
0.040
  W.S. Elev (ft)            665.46    Reach Len. (ft)           223.00
202.00     180.00
  Crit W.S. (ft)            665.46    Flow Area (sq ft)
110.85
  E.G. Slope (ft/ft)      0.022816    Area (sq ft)
110.85
  Q Total (cfs)             674.70    Flow (cfs)
674.70
  Top Width (ft)             98.00    Top Width (ft)
98.00
  Vel Total (ft/s)            6.09    Avg. Vel. (ft/s)
6.09
  Max Chl Dpth (ft)           2.17    Hydr. Depth (ft)
1.13
  Conv. Total (cfs)         4466.8    Conv. (cfs)
4466.8
  Length Wtd. (ft)          202.00    Wetted Per. (ft)
98.13
  Min Ch El (ft)            663.29    Shear (lb/sq ft)
1.61
  Alpha                       1.00    Stream Power (lb/ft s)    600.00
0.00       0.00
  Frctn Loss (ft)             0.07    Cum Volume (acre-ft)
18.71
  C & E Loss (ft)             0.17    Cum SA (acres)
5.71


Warning: The energy equation could not be balanced within the specified
number of iterations.  The program used critical depth
         for the water surface and continued on with the calculations.
```

```
Warning: The velocity head has changed by more than 0.5 ft (0.15 m).
This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream
conveyance) is less than 0.7 or greater than 1.4.
          This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the
current and previous cross section.  This may indicate the
         need for additional cross sections.
Warning: During the standard step iterations, when the assumed water
surface was set equal to critical depth, the calculated
         water surface came back below critical depth.  This indicates
that there is not a valid subcritical answer.  The program
         defaulted to critical depth.

CROSS SECTION


RIVER: Agua Hedionda
REACH: SM Highlands       RS: 10

INPUT
Description:
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
    7.61  699.57   33.88  691.15  109.68     675  156.53  668.82  229.75
656
  360.07     656  425.32  674.44   486.5  688.78     600     689

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
    7.61     .03  156.53     .04  425.32     .03

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
        156.53  425.32              138     206     267             .1
.3

CROSS SECTION OUTPUT  Profile #100 yr

  E.G. Elev (ft)            660.63    Element                   Left OB
Channel   Right OB
  Vel Head (ft)               0.01    Wt. n-Val.
0.040
  W.S. Elev (ft)            660.62    Reach Len. (ft)           138.00
206.00     267.00
  Crit W.S. (ft)                      Flow Area (sq ft)
699.99
  E.G. Slope (ft/ft)      0.000105    Area (sq ft)
699.99
  Q Total (cfs)             674.70    Flow (cfs)
674.70
  Top Width (ft)            173.01    Top Width (ft)
173.01
```

```
  Vel Total (ft/s)            0.96    Avg. Vel. (ft/s)
0.96
  Max Chl Dpth (ft)           4.62    Hydr. Depth (ft)
4.05
  Conv. Total (cfs)        65761.3    Conv. (cfs)
65761.3
  Length Wtd. (ft)          206.00    Wetted Per. (ft)
174.05
  Min Ch El (ft)            656.00    Shear (lb/sq ft)
0.03
  Alpha                       1.00    Stream Power (lb/ft s)    600.00
0.00       0.00
  Frctn Loss (ft)             0.02    Cum Volume (acre-ft)
16.83
  C & E Loss (ft)             0.00    Cum SA (acres)
5.08


CROSS SECTION


RIVER: Agua Hedionda
REACH: SM Highlands       RS: 9

INPUT
Description:
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0  712.95    5.98     710  115.62     710   187.3     675  207.52
670
  240.74     656  392.94     656  414.44     665     459  675.27   487.2
679.95
  574.16  679.13  580.28     682

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .03   187.3     .04     459     .03

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
         187.3     459              144     202     677             .1
.3

CROSS SECTION OUTPUT  Profile #100 yr

  E.G. Elev (ft)            660.61    Element                   Left OB
Channel   Right OB
  Vel Head (ft)               0.01    Wt. n-Val.
0.040
  W.S. Elev (ft)            660.60    Reach Len. (ft)           144.00
202.00     677.00
  Crit W.S. (ft)                      Flow Area (sq ft)
750.02
```

```
  E.G. Slope (ft/ft)      0.000085    Area (sq ft)
750.02
  Q Total (cfs)             674.70    Flow (cfs)
674.70
  Top Width (ft)            174.09    Top Width (ft)
174.09
  Vel Total (ft/s)            0.90    Avg. Vel. (ft/s)
0.90
  Max Chl Dpth (ft)           4.60    Hydr. Depth (ft)
4.31
  Conv. Total (cfs)        73249.6    Conv. (cfs)
73249.6
  Length Wtd. (ft)          202.00    Wetted Per. (ft)
175.94
  Min Ch El (ft)            656.00    Shear (lb/sq ft)
0.02
  Alpha                       1.00    Stream Power (lb/ft s)    580.28
0.00       0.00
  Frctn Loss (ft)             0.00    Cum Volume (acre-ft)
13.40
  C & E Loss (ft)             0.00    Cum SA (acres)
4.26


Warning: The conveyance ratio (upstream conveyance divided by downstream
conveyance) is less than 0.7 or greater than 1.4.
          This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: Agua Hedionda
REACH: SM Highlands       RS: 8

INPUT
Description:
Station Elevation Data    num=      14
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0     710   89.94     710  137.54  684.23  188.84  670.63  237.78
655.63
  345.23  646.36  394.69  655.76  429.46  656.43  451.45  663.15  482.96
662.26
  515.68  665.79  526.53  668.84  538.31  669.65   581.5  670.03

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .03  188.84    .035  451.45     .03

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
        188.84  451.45              240     202     612             .3
.5
```

CROSS SECTION OUTPUT  Profile #100 yr

```
  E.G. Elev (ft)            660.60    Element                    Left OB
Channel   Right OB
  Vel Head (ft)               0.00    Wt. n-Val.
0.035
  W.S. Elev (ft)            660.60    Reach Len. (ft)            240.00
202.00     612.00
  Crit W.S. (ft)            649.66    Flow Area (sq ft)
1729.62
  E.G. Slope (ft/ft)      0.000006    Area (sq ft)
1729.62
  Q Total (cfs)             674.70    Flow (cfs)
674.70
  Top Width (ft)            221.55    Top Width (ft)
221.55
  Vel Total (ft/s)            0.39    Avg. Vel. (ft/s)
0.39
  Max Chl Dpth (ft)          14.24    Hydr. Depth (ft)
7.81
  Conv. Total (cfs)       286688.6    Conv. (cfs)
286688.6
  Length Wtd. (ft)          202.00    Wetted Per. (ft)
224.21
  Min Ch El (ft)            646.36    Shear (lb/sq ft)
0.00
  Alpha                       1.00    Stream Power (lb/ft s)    581.50
0.00       0.00
  Frctn Loss (ft)                     Cum Volume (acre-ft)
7.65
  C & E Loss (ft)                     Cum SA (acres)
3.34
```

CULVERT

RIVER: Agua Hedionda
REACH: SM Highlands  RS: 7.5

INPUT
Description:
Distance from Upstream XS =  90
Deck/Roadway Width  =  88
Weir Coefficient  =  2.6
Upstream  Deck/Roadway Coordinates
num=  10

| Sta | Hi Cord | Lo Cord | Sta | Hi Cord | Lo Cord | Sta | Hi Cord | Lo Cord |
|---|---|---|---|---|---|---|---|---|
| 0 | 680 | | 89.94 | 675 | | 137.5 | 670 | |
| 189 | 669 | | 238 | 667 | | 310 | 663.82 | |
| 395 | 667 | | 429.5 | 669 | | 483 | 670 | |
| 600 | 675 | | | | | | | |

Upstream Bridge Cross Section Data

```
Station Elevation Data    num=      14
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0     710   89.94     710  137.54  684.23  188.84  670.63  237.78
655.63
  345.23  646.36  394.69  655.76  429.46  656.43  451.45  663.15  482.96
662.26
  515.68  665.79  526.53  668.84  538.31  669.65   581.5  670.03

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .03  188.84    .035  451.45     .03

Bank Sta: Left   Right    Coeff Contr.   Expan.
        188.84  451.45             .3       .5

Downstream  Deck/Roadway Coordinates
    num=      10
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0     680           89.94     675           137.5     670
     189     669             238     667             310  663.82
     395     667           429.5     669             483     670
     600     675

Downstream Bridge Cross Section Data
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0  688.21   68.13  676.53  189.82  665.81  203.13  659.96  302.09
636.8
  343.57  638.65  411.35  639.86  472.13  638.22  527.67  665.85  580.09
665.88

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .03  203.13    .035  527.67     .03

Bank Sta: Left   Right    Coeff Contr.   Expan.
        203.13  527.67             .3       .5

Upstream Embankment side slope              =       0 horiz. to 1.0
vertical
Downstream Embankment side slope            =       0 horiz. to 1.0
vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1      Circular       7
```

FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 3 - Groove end entrance; pipe projecting from fill
Solution Criteria = Highest U.S. EG

| Culvert | Upstrm Dist | Length | Top n | Bottom n | Depth Blocked | Entrance Loss Coef | Exit Loss Coef |
|---|---|---|---|---|---|---|---|
| | 90 | 102 | .013 | .013 | 0 | .5 | 1 |

Upstream Elevation = 646.36
Centerline Station = 345.23
Downstream Elevation = 636.8
Centerline Station = 300

CULVERT OUTPUT Profile #100 yr Culv Group: Culvert #1

| | | | |
|---|---|---|---|
| Q Culv Group (cfs) | 674.70 | Culv Full Len (ft) | |
| # Barrels | 1 | Culv Vel US (ft/s) | 17.53 |
| Q Barrel (cfs) | 674.70 | Culv Vel DS (ft/s) | 31.40 |
| E.G. US. (ft) | 660.60 | Culv Inv El Up (ft) | 646.36 |
| W.S. US. (ft) | 660.60 | Culv Inv El Dn (ft) | 636.80 |
| E.G. DS (ft) | 639.84 | Culv Frctn Ls (ft) | 2.28 |
| W.S. DS (ft) | 639.38 | Culv Exit Loss (ft) | 16.09 |
| Delta EG (ft) | 20.76 | Culv Entr Loss (ft) | 2.39 |
| Delta WS (ft) | 21.22 | Q Weir (cfs) | |
| E.G. IC (ft) | 660.60 | Weir Sta Lft (ft) | |
| E.G. OC (ft) | 660.50 | Weir Sta Rgt (ft) | |
| Culvert Control | Inlet | Weir Submerg | |
| Culv WS Inlet (ft) | 653.36 | Weir Max Depth (ft) | |
| Culv WS Outlet (ft) | 640.62 | Weir Avg Depth (ft) | |
| Culv Nml Depth (ft) | 2.83 | Weir Flow Area (sq ft) | |
| Culv Crt Depth (ft) | 6.49 | Min El Weir Flow (ft) | 663.83 |

Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section downstream of the culvert has supercritical flow.
Note: The flow in the culvert is entirely supercritical.

CROSS SECTION

RIVER: Agua Hedionda
REACH: SM Highlands RS: 7

INPUT
Description:
Station Elevation Data num= 10

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 688.21 | 68.13 | 676.53 | 189.82 | 665.81 | 203.13 | 659.96 | 302.09 | 636.8 |
| 343.57 | 638.65 | 411.35 | 639.86 | 472.13 | 638.22 | 527.67 | 665.85 | 580.09 | 665.88 |

Manning's n Values num= 3

```
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .03  203.13    .035  527.67     .03

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
        203.13  527.67              299     226     141             .3
.5

CROSS SECTION OUTPUT  Profile #100 yr

  E.G. Elev (ft)           639.84    Element                   Left OB
Channel   Right OB
  Vel Head (ft)              0.46    Wt. n-Val.
0.035
  W.S. Elev (ft)           639.38    Reach Len. (ft)           299.00
226.00     141.00
  Crit W.S. (ft)           639.38    Flow Area (sq ft)
124.25
  E.G. Slope (ft/ft)      0.019084   Area (sq ft)
124.25
  Q Total (cfs)            674.70    Flow (cfs)
674.70
  Top Width (ft)           138.84    Top Width (ft)
138.84
  Vel Total (ft/s)           5.43    Avg. Vel. (ft/s)
5.43
  Max Chl Dpth (ft)          2.58    Hydr. Depth (ft)
0.89
  Conv. Total (cfs)        4884.0    Conv. (cfs)
4884.0
  Length Wtd. (ft)         226.00    Wetted Per. (ft)
139.48
  Min Ch El (ft)           636.80    Shear (lb/sq ft)
1.06
  Alpha                      1.00    Stream Power (lb/ft s)    580.09
0.00       0.00
  Frctn Loss (ft)            3.90    Cum Volume (acre-ft)
3.94
  C & E Loss (ft)            0.09    Cum SA (acres)
2.51


Warning: The energy equation could not be balanced within the specified
number of iterations.  The program used critical depth
         for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream
conveyance) is less than 0.7 or greater than 1.4.
          This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the
current and previous cross section.  This may indicate the
         need for additional cross sections.
Warning: During the standard step iterations, when the assumed water
surface was set equal to critical depth, the calculated
```

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Agua Hedionda
REACH: SM Highlands RS: 6

INPUT
Description:
Station Elevation Data num= 15

| Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 646.12 | 39.1 | 646.12 | 63.94 | 656.12 | 70.61 | 656.12 | 78.77 | 652.45 |
| 150.24 | 643.59 | 202.82 | 636.47 | 254.54 | 632 | 309.92 | 630.37 | 328.81 | 631.28 |
| 367.26 | 638.48 | 417.21 | 661.27 | 512.01 | 662.17 | 542.62 | 670.46 | 600 | 675.2 |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|---|---|---|---|---|---|
| 0 | .03 | 150.24 | .035 | 367.26 | .03 |

| Bank Sta: Left | Right | Lengths: Left | Channel | Right | Coeff Contr. | Expan. |
|---|---|---|---|---|---|---|
| 150.24 | 367.26 | 114 | 296 | 522 | .1 | .3 |

CROSS SECTION OUTPUT Profile #100 yr

| | | | | | | |
|---|---|---|---|---|---|---|
| E.G. Elev (ft) | 633.51 | Element | Left OB | Channel | Right OB | |
| Vel Head (ft) | 0.75 | Wt. n-Val. | 0.035 | | | |
| W.S. Elev (ft) | 632.76 | Reach Len. (ft) | 114.00 | 296.00 | 522.00 | |
| Crit W.S. (ft) | 632.76 | Flow Area (sq ft) | 133.31 | | | |
| E.G. Slope (ft/ft) | 0.016080 | Area (sq ft) | 133.31 | | | |
| Q Total (cfs) | 924.00 | Flow (cfs) | 924.00 | | | |
| Top Width (ft) | 91.03 | Top Width (ft) | 91.03 | | | |
| Vel Total (ft/s) | 6.93 | Avg. Vel. (ft/s) | 6.93 | | | |
| Max Chl Dpth (ft) | 2.39 | Hydr. Depth (ft) | 1.46 | | | |
| Conv. Total (cfs) | 7286.6 | Conv. (cfs) | 7286.6 | | | |

```
  Length Wtd. (ft)          296.00    Wetted Per. (ft)
91.25
  Min Ch El (ft)            630.37    Shear (lb/sq ft)
1.47
  Alpha                       1.00    Stream Power (lb/ft s)    600.00
0.00       0.00
  Frctn Loss (ft)             4.64    Cum Volume (acre-ft)
3.27
  C & E Loss (ft)             0.01    Cum SA (acres)
1.91


Warning: The energy equation could not be balanced within the specified
number of iterations.  The program used critical depth
         for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the
current and previous cross section.  This may indicate the
         need for additional cross sections.
Warning: During the standard step iterations, when the assumed water
surface was set equal to critical depth, the calculated
         water surface came back below critical depth.  This indicates
that there is not a valid subcritical answer.  The program
         defaulted to critical depth.

CROSS SECTION


RIVER: Agua Hedionda
REACH: SM Highlands       RS: 5

INPUT
Description:
Station Elevation Data    num=      18
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
    5.35     691   78.22  656.12   95.46  656.12   110.9  649.73  119.07
648.46
  129.96  649.59  147.98  656.12  153.98  656.12  181.21  642.51  239.77
625
  265.97     622  291.22  625.01  310.41   625.2   347.9     635  390.74
647.99
  414.77  645.32  489.97  645.08  590.71  710.45

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
    5.35     .03  181.21    .035  390.74     .03

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
        181.21  390.74              249     202     154             .1
.3

CROSS SECTION OUTPUT  Profile #100 yr
```

```
  E.G. Elev (ft)            626.54    Element                   Left OB
Channel   Right OB
  Vel Head (ft)               0.84    Wt. n-Val.
0.035
  W.S. Elev (ft)            625.70    Reach Len. (ft)           249.00
202.00     154.00
  Crit W.S. (ft)            625.70    Flow Area (sq ft)
125.46
  E.G. Slope (ft/ft)      0.015259    Area (sq ft)
125.46
  Q Total (cfs)             924.00    Flow (cfs)
924.00
  Top Width (ft)             74.86    Top Width (ft)
74.86
  Vel Total (ft/s)            7.37    Avg. Vel. (ft/s)
7.37
  Max Chl Dpth (ft)           3.70    Hydr. Depth (ft)
1.68
  Conv. Total (cfs)         7480.1    Conv. (cfs)
7480.1
  Length Wtd. (ft)          202.00    Wetted Per. (ft)
75.38
  Min Ch El (ft)            622.00    Shear (lb/sq ft)
1.59
  Alpha                       1.00    Stream Power (lb/ft s)    590.71
0.00       0.00
  Frctn Loss (ft)             3.12    Cum Volume (acre-ft)
2.39
  C & E Loss (ft)             0.01    Cum SA (acres)
1.35


Warning: The energy equation could not be balanced within the specified
number of iterations.  The program used critical depth
         for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the
current and previous cross section.  This may indicate the
         need for additional cross sections.
Warning: During the standard step iterations, when the assumed water
surface was set equal to critical depth, the calculated
         water surface came back below critical depth.  This indicates
that there is not a valid subcritical answer.  The program
         defaulted to critical depth.

CROSS SECTION


RIVER: Agua Hedionda
REACH: SM Highlands       RS: 4

INPUT
Description:
Station Elevation Data    num=      12
```

```
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0     689   77.66     689  168.69  648.92  171.18  636.81  257.14
620
  304.78  617.02  338.76     618  420.47  641.26  425.47  638.82  525.12
637.28
  589.71  675.77     600  676.63

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .03  171.18    .035  420.47     .03

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
        171.18  420.47              262     206     149             .1
.3

CROSS SECTION OUTPUT  Profile #100 yr

  E.G. Elev (ft)            620.40    Element                   Left OB
Channel   Right OB
  Vel Head (ft)               0.81    Wt. n-Val.
0.035
  W.S. Elev (ft)            619.59    Reach Len. (ft)           262.00
206.00     149.00
  Crit W.S. (ft)            619.59    Flow Area (sq ft)
128.14
  E.G. Slope (ft/ft)      0.015656    Area (sq ft)
128.14
  Q Total (cfs)             924.00    Flow (cfs)
924.00
  Top Width (ft)             80.71    Top Width (ft)
80.71
  Vel Total (ft/s)            7.21    Avg. Vel. (ft/s)
7.21
  Max Chl Dpth (ft)           2.57    Hydr. Depth (ft)
1.59
  Conv. Total (cfs)         7384.8    Conv. (cfs)
7384.8
  Length Wtd. (ft)          206.00    Wetted Per. (ft)
81.02
  Min Ch El (ft)            617.02    Shear (lb/sq ft)
1.55
  Alpha                       1.00    Stream Power (lb/ft s)    600.00
0.00       0.00
  Frctn Loss (ft)             3.12    Cum Volume (acre-ft)
1.80
  C & E Loss (ft)             0.01    Cum SA (acres)
0.99


Warning: The energy equation could not be balanced within the specified
number of iterations.  The program used critical depth
         for the water surface and continued on with the calculations.
```

```
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the
current and previous cross section.  This may indicate the
         need for additional cross sections.
Warning: During the standard step iterations, when the assumed water
surface was set equal to critical depth, the calculated
         water surface came back below critical depth.  This indicates
that there is not a valid subcritical answer.  The program
         defaulted to critical depth.

CROSS SECTION


RIVER: Agua Hedionda
REACH: SM Highlands       RS: 3

INPUT
Description:
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0  679.69   61.42  660.18  131.25  638.04  214.06  617.82  293.57
609.91
   388.1  622.78  468.95  631.79   576.7  629.46     600  641.86

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .03  131.25    .035   388.1     .03

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
        131.25   388.1              399     240      89             .1
.3

CROSS SECTION OUTPUT  Profile #100 yr

  E.G. Elev (ft)            614.54    Element                    Left OB
Channel   Right OB
  Vel Head (ft)               0.93    Wt. n-Val.
0.035
  W.S. Elev (ft)            613.62    Reach Len. (ft)           399.00
240.00      89.00
  Crit W.S. (ft)            613.62    Flow Area (sq ft)
119.50
  E.G. Slope (ft/ft)      0.014702    Area (sq ft)
119.50
  Q Total (cfs)             924.00    Flow (cfs)
924.00
  Top Width (ft)             64.48    Top Width (ft)
64.48
  Vel Total (ft/s)            7.73    Avg. Vel. (ft/s)
7.73
  Max Chl Dpth (ft)           3.71    Hydr. Depth (ft)
1.85
```

```
  Conv. Total (cfs)         7620.5    Conv. (cfs)
7620.5
  Length Wtd. (ft)          240.00    Wetted Per. (ft)
64.92
  Min Ch El (ft)            609.91    Shear (lb/sq ft)
1.69
  Alpha                       1.00    Stream Power (lb/ft s)    600.00
0.00       0.00
  Frctn Loss (ft)             3.53    Cum Volume (acre-ft)
1.22
  C & E Loss (ft)             0.01    Cum SA (acres)
0.64


Warning: The energy equation could not be balanced within the specified
number of iterations.  The program used critical depth
         for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the
current and previous cross section.  This may indicate the
         need for additional cross sections.
Warning: During the standard step iterations, when the assumed water
surface was set equal to critical depth, the calculated
         water surface came back below critical depth.  This indicates
that there is not a valid subcritical answer.  The program
         defaulted to critical depth.

CROSS SECTION


RIVER: Agua Hedionda
REACH: SM Highlands       RS: 2

INPUT
Description:
Station Elevation Data    num=      14
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0  659.48   18.83     658   70.32  662.82  138.41     661  194.46
633.27
  247.88     610  293.92     605  299.01  603.51  335.08  609.99  414.94
620.39
  447.36  626.37  542.94   625.5  563.04  638.46     600  642.32

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .03  194.46    .035  414.94     .03

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
        194.46  414.94              310     212     114             .1
.3

CROSS SECTION OUTPUT  Profile #100 yr
```

```
  E.G. Elev (ft)           608.97    Element                   Left OB
Channel   Right OB
  Vel Head (ft)              1.02    Wt. n-Val.
0.035
  W.S. Elev (ft)           607.96    Reach Len. (ft)           310.00
212.00     114.00
  Crit W.S. (ft)           607.96    Flow Area (sq ft)
114.11
  E.G. Slope (ft/ft)     0.014699    Area (sq ft)
114.11
  Q Total (cfs)            924.00    Flow (cfs)
924.00
  Top Width (ft)            57.06    Top Width (ft)
57.06
  Vel Total (ft/s)           8.10    Avg. Vel. (ft/s)
8.10
  Max Chl Dpth (ft)          4.45    Hydr. Depth (ft)
2.00
  Conv. Total (cfs)        7621.3    Conv. (cfs)
7621.3
  Length Wtd. (ft)         212.00    Wetted Per. (ft)
57.83
  Min Ch El (ft)           603.51    Shear (lb/sq ft)
1.81
  Alpha                      1.00    Stream Power (lb/ft s)    600.00
0.00       0.00
  Frctn Loss (ft)            3.16    Cum Volume (acre-ft)
0.57
  C & E Loss (ft)            0.04    Cum SA (acres)
0.31


Warning: The energy equation could not be balanced within the specified
number of iterations.  The program used critical depth
         for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the
current and previous cross section.  This may indicate the
         need for additional cross sections.
Warning: During the standard step iterations, when the assumed water
surface was set equal to critical depth, the calculated
         water surface came back below critical depth.  This indicates
that there is not a valid subcritical answer.  The program
         defaulted to critical depth.

CROSS SECTION


RIVER: Agua Hedionda
REACH: SM Highlands       RS: 1

INPUT
Description:
Station Elevation Data    num=      10
```

```
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0  637.79   185.1  638.02  210.62     625  261.76  604.26  291.83
601.15
  332.51     601  345.96     605   394.7  613.21  500.66     622     600
639.56

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .03  210.62    .035   394.7     .03

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
        210.62   394.7                0       0       0             .1
.3

CROSS SECTION OUTPUT  Profile #100 yr

  E.G. Elev (ft)            604.19    Element                    Left OB
Channel   Right OB
  Vel Head (ft)               0.89    Wt. n-Val.
0.035
  W.S. Elev (ft)            603.30    Reach Len. (ft)
  Crit W.S. (ft)            603.30    Flow Area (sq ft)
121.88
  E.G. Slope (ft/ft)      0.015127    Area (sq ft)
121.88
  Q Total (cfs)             924.00    Flow (cfs)
924.00
  Top Width (ft)             69.23    Top Width (ft)
69.23
  Vel Total (ft/s)            7.58    Avg. Vel. (ft/s)
7.58
  Max Chl Dpth (ft)           2.30    Hydr. Depth (ft)
1.76
  Conv. Total (cfs)         7512.6    Conv. (cfs)
7512.6
  Length Wtd. (ft)                    Wetted Per. (ft)
69.67
  Min Ch El (ft)            601.00    Shear (lb/sq ft)
1.65
  Alpha                       1.00    Stream Power (lb/ft s)    600.00
0.00       0.00
  Frctn Loss (ft)                     Cum Volume (acre-ft)
  C & E Loss (ft)                     Cum SA (acres)



SUMMARY OF MANNING'S N VALUES

River:Agua Hedionda

      Reach          River Sta.       n1        n2        n3
```

| | | | | |
|---|---|---|---|---|
| SM Highlands | 18 | .03 | .035 | .03 |
| SM Highlands | 17 | .03 | .035 | .03 |
| SM Highlands | 16 | .03 | .035 | .03 |
| SM Highlands | 15 | .03 | .035 | .03 |
| SM Highlands | 14 | .03 | .035 | .03 |
| SM Highlands | 13 | .03 | .035 | .03 |
| SM Highlands | 12 | .03 | .035 | .03 |
| SM Highlands | 11 | .03 | .04 | .03 |
| SM Highlands | 10 | .03 | .04 | .03 |
| SM Highlands | 9 | .03 | .04 | .03 |
| SM Highlands | 8 | .03 | .035 | .03 |
| SM Highlands | 7.5 | Culvert | | |
| SM Highlands | 7 | .03 | .035 | .03 |
| SM Highlands | 6 | .03 | .035 | .03 |
| SM Highlands | 5 | .03 | .035 | .03 |
| SM Highlands | 4 | .03 | .035 | .03 |
| SM Highlands | 3 | .03 | .035 | .03 |
| SM Highlands | 2 | .03 | .035 | .03 |
| SM Highlands | 1 | .03 | .035 | .03 |

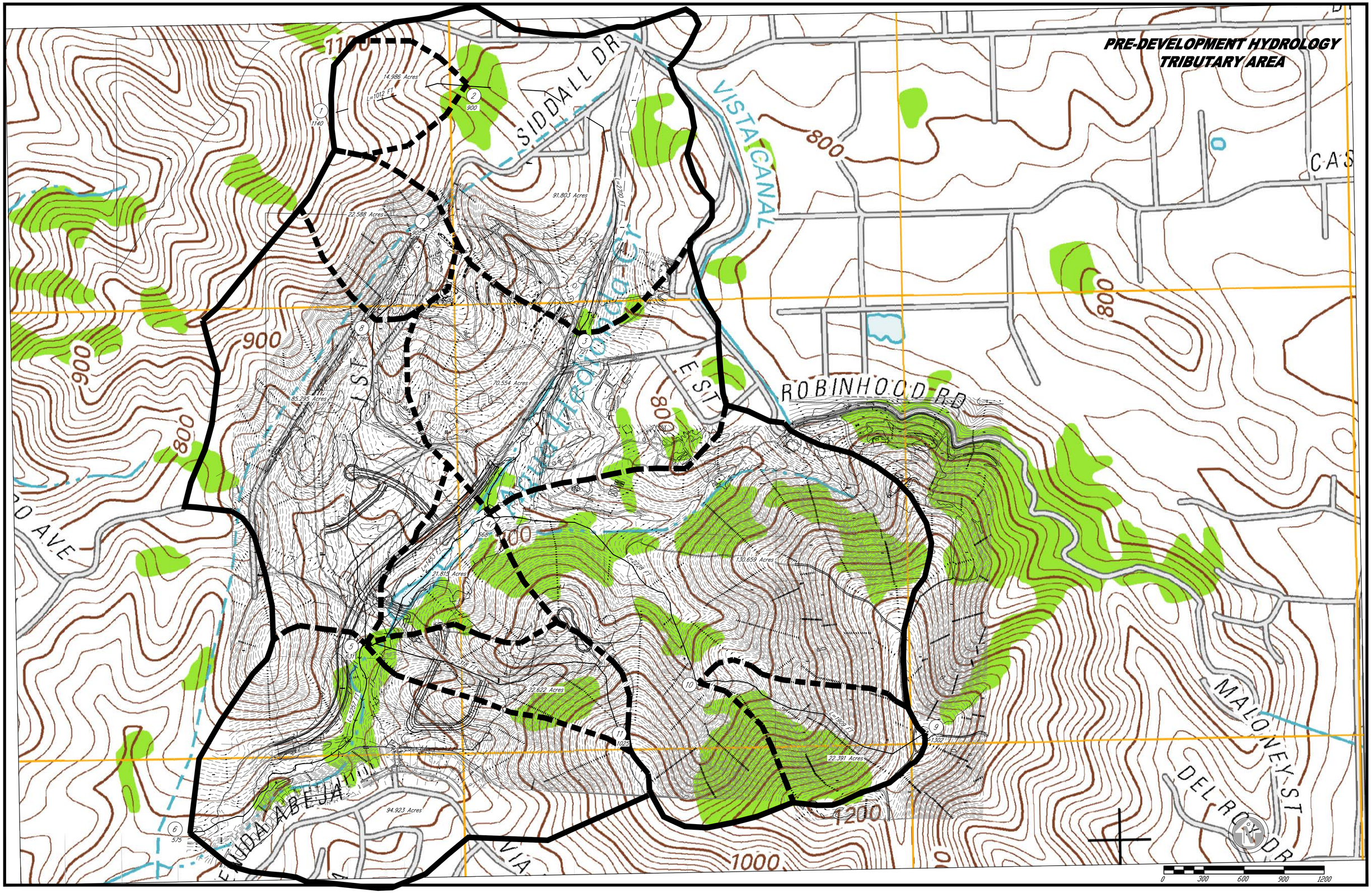
SUMMARY OF REACH LENGTHS

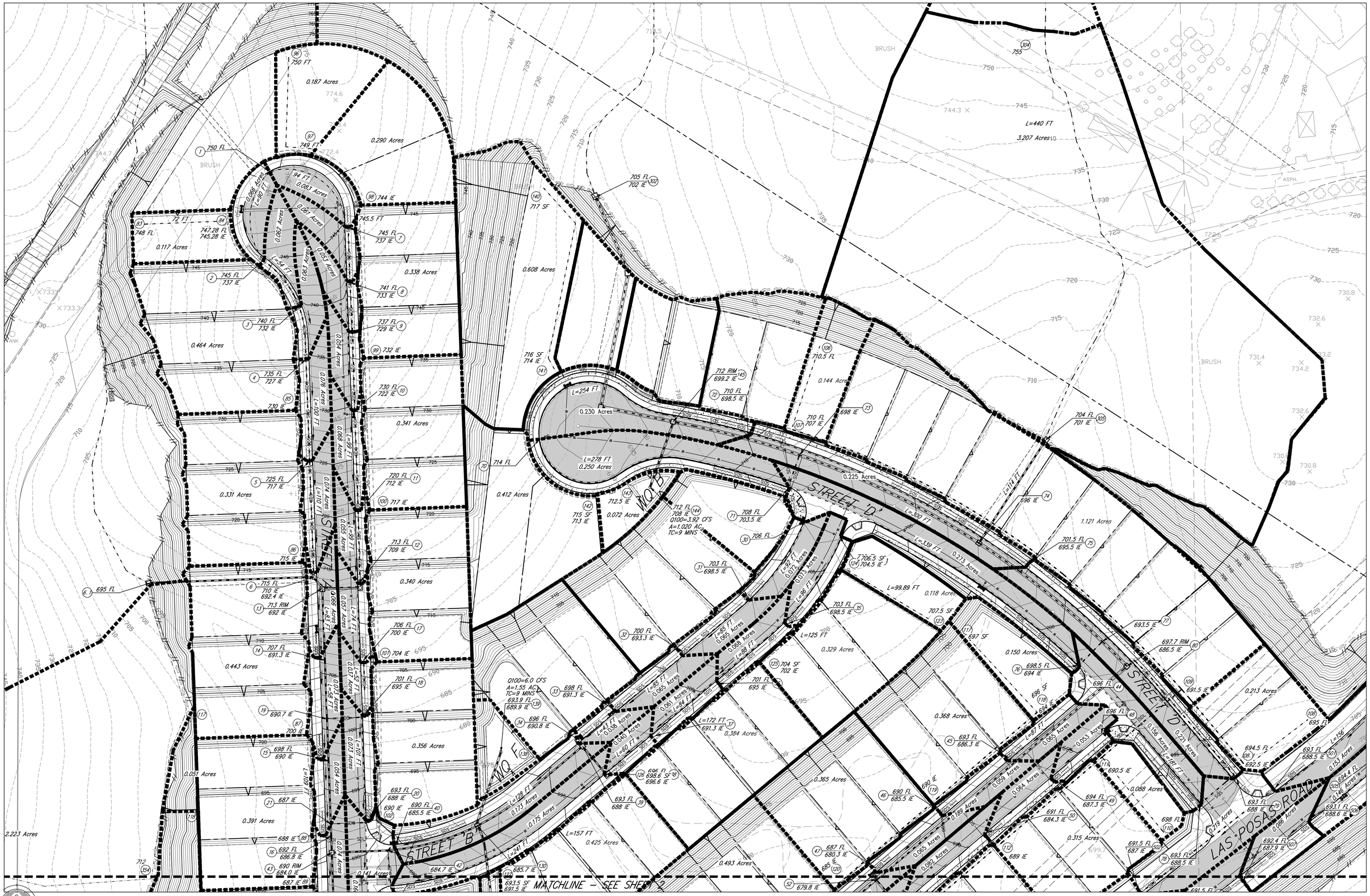
River: Agua Hedionda

| Reach | River Sta. | Left | Channel | Right |
|---|---|---|---|---|
| SM Highlands | 18 | 251 | 201 | 149.5 |
| SM Highlands | 17 | 170 | 200 | 230 |
| SM Highlands | 16 | 201 | 201 | 201 |
| SM Highlands | 15 | 164 | 203 | 238 |
| SM Highlands | 14 | 336 | 221 | 89 |
| SM Highlands | 13 | 200 | 200 | 200 |
| SM Highlands | 12 | 200 | 200 | 200 |
| SM Highlands | 11 | 223 | 202 | 180 |
| SM Highlands | 10 | 138 | 206 | 267 |
| SM Highlands | 9 | 144 | 202 | 677 |
| SM Highlands | 8 | 240 | 202 | 612 |
| SM Highlands | 7.5 | Culvert | | |
| SM Highlands | 7 | 299 | 226 | 141 |
| SM Highlands | 6 | 114 | 296 | 522 |
| SM Highlands | 5 | 249 | 202 | 154 |
| SM Highlands | 4 | 262 | 206 | 149 |
| SM Highlands | 3 | 399 | 240 | 89 |
| SM Highlands | 2 | 310 | 212 | 114 |
| SM Highlands | 1 | 0 | 0 | 0 |

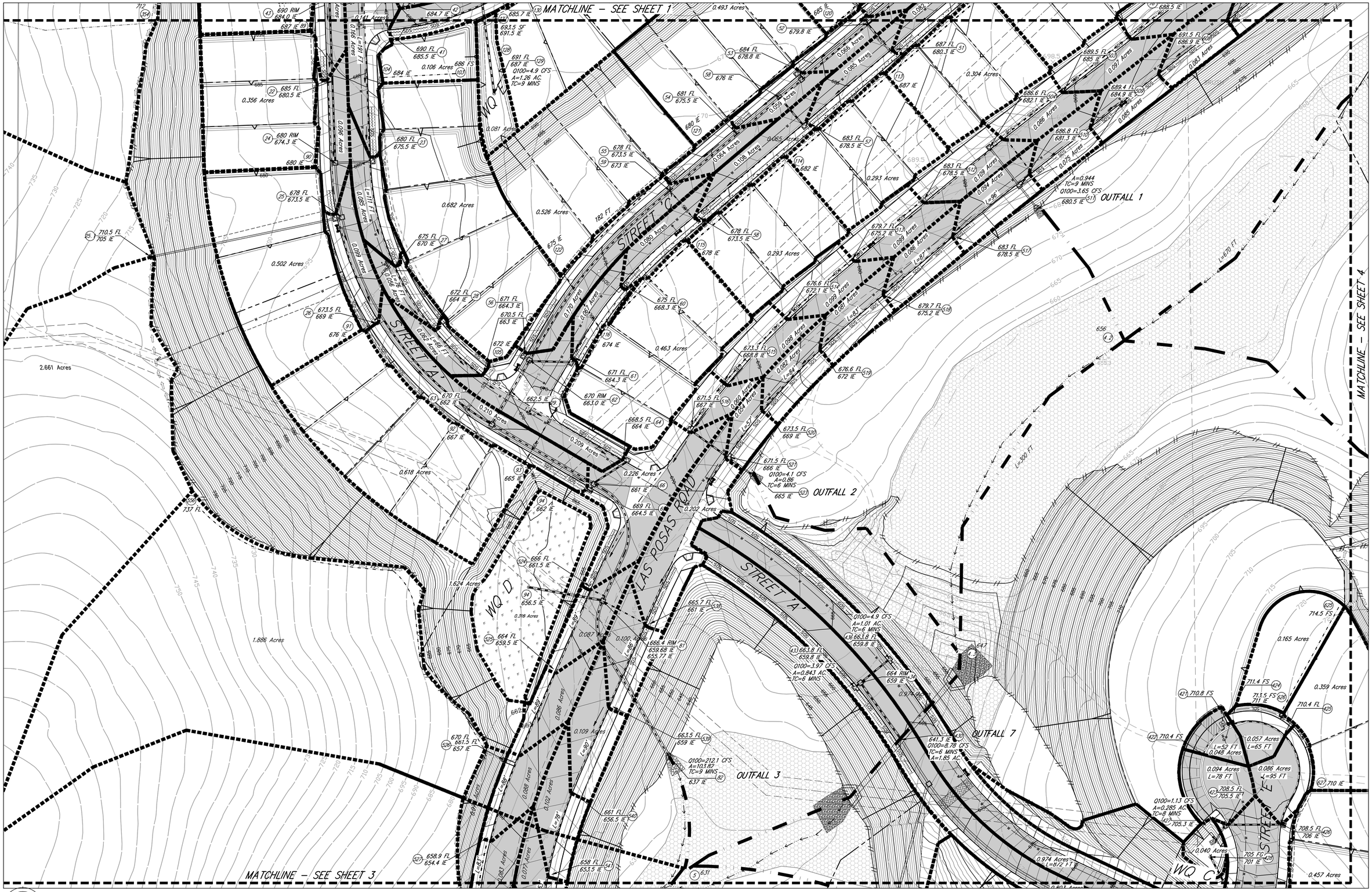
# APPENDIX 7

# PRE- AND POST-DEVELOPMENT HYDROLOGY BASIN MAPS


PRE-DEVELOPMENT HYDROLOGY
TRIBUTARY AREA
SIDDALL DR
VISTA CANAL
ROBINHOOD RD
MALONEY ST
DEL ROSA DR
14.986 Acres
91.803 Acres
22.588 Acres
70.554 Acres
85.295 Acres
21.815 Acres
130.659 Acres
22.622 Acres
22.391 Acres
94.923 Acres
1100
1000
900
800
1200
0
300
600
900
1200



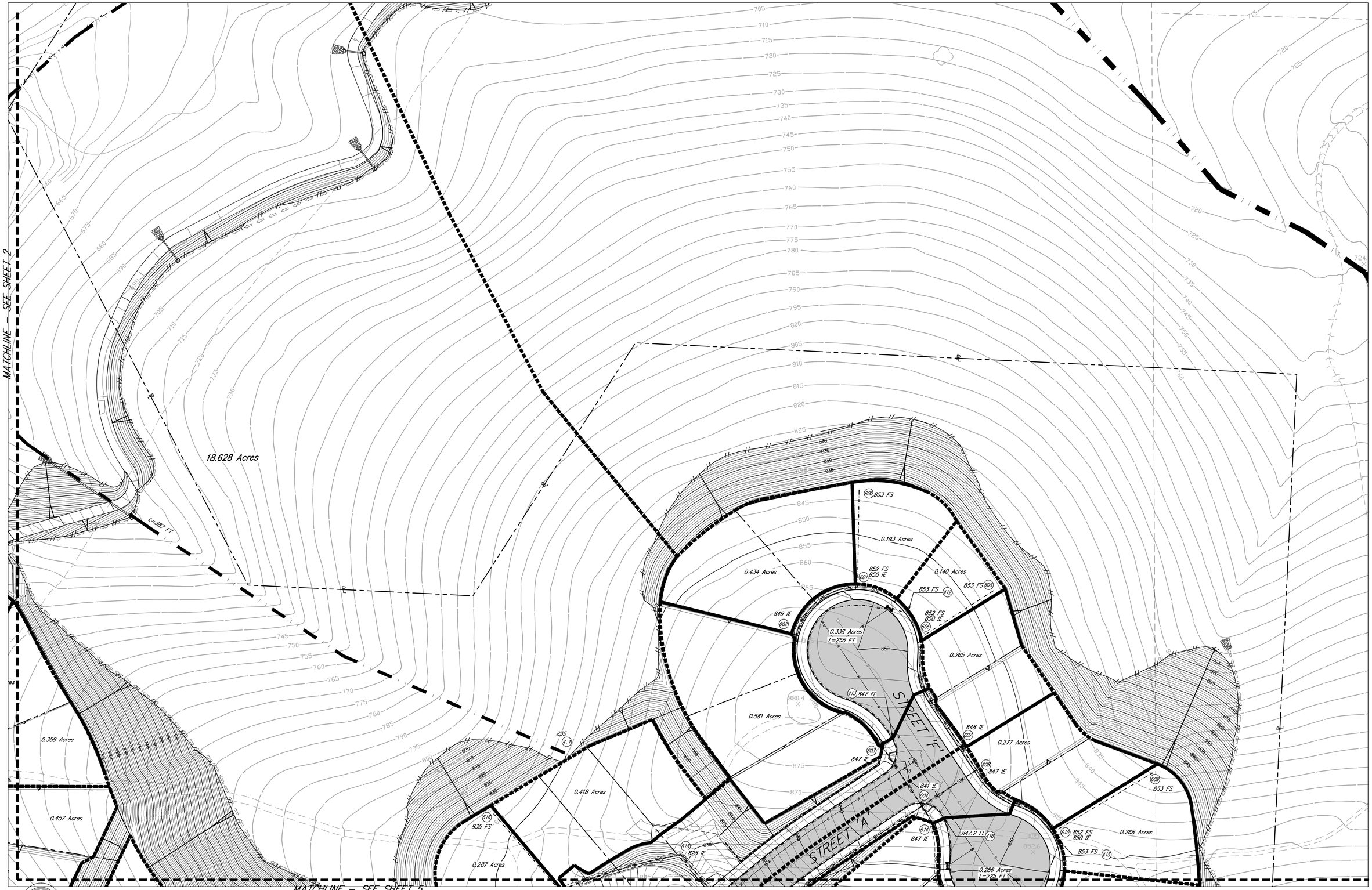

POST DEVELOPMENT
HYDROLOGY BASIN MAP SHT-1




**POST DEVELOPMENT**
**HYDROLOGY BASIN MAP SHT-2**


**POST DEVELOPMENT**
**HYDROLOGY BASIN MAP SHT-3**


POST DEVELOPMENT
HYDROLOGY BASIN MAP SHT-5




SCALE: 1"=40'

0 40 80 120 160

**POST DEVELOPMENT**
**HYDROLOGY BASIN MAP SHT-4**

# OVERALL POST-DEVELOPMENT HYDROLOGY TRIBUTARY AREA