File.... C:\Shap_Ass\Active Projects\Warner Ranch\3rd Submital\Pond Pack\BMP 1\5508RPL4-100 YR-BMP 1.PPW

OUTLET STRUCTURE INPUT DATA

Structure ID	=	CV	
Structure Type	=	Culvert-Circular	
No. Barrels	=	1	
Barrel Diameter	=	3.0000	ft
Upstream Invert	=	400.00	ft
Dnstream Invert	=	399.00	ft
Horiz. Length	=	72.35	ft
Barrel Length	=	72.36	ft
Barrel Slope	=	.01382	ft/ft

OUTLET CONTROL DATA...

Mannings n	=	.0130	
Ke	=	.5000	(forward entrance loss)
Kb	=	.007228	(per ft of full flow)
Kr	=	.5000	(reverse entrance loss)
HW Convergence	=	.001	+/- ft

INLET CONTROL DATA...

Equation form	=	1	
Inlet Control K	=	.0078	
Inlet Control M	=	2.0000	
Inlet Control c	=	.03790	
Inlet Control Y	=	.6900	
T1 ratio (HW/D)	=	1.129	
T2 ratio (HW/D)	=	1.289	
Slope Factor	=	-.500	

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control, interpolate between flows at T1 & T2...
At T1 Elev = 403.39 ft ---> Flow = 42.85 cfs
At T2 Elev = 403.87 ft ---> Flow = 48.97 cfs

File.... C:\Shap_Ass\Active Projects\Warner Ranch\3rd Submital\Pond Pack\BMP 1\5508RPL4-100 YR-BMP 1.PPW

OUTLET STRUCTURE INPUT DATA

Structure ID = TW
Structure Type = TW SETUP, DS Channel

USE DOWNSTREAM CHANNEL NORMAL DEPTH FOR TW...
Channel Type: Chn-Circular
Channel ID: Chn-Cir - 1

CONVERGENCE TOLERANCES...
Maximum Iterations= 40
Min. TW tolerance = .01 ft
Max. TW tolerance = .01 ft
Min. HW tolerance = .01 ft
Max. HW tolerance = .01 ft
Min. Q tolerance = .00 cfs
Max. Q tolerance = .00 cfs

File.... C:\Shap_Ass\Active Projects\Warner Ranch\3rd Submital\Pond Pack\BMP 1\5508RPL4-100 YR-BMP 1.PPW

USE DOWNSTREAM CHANNEL NORMAL DEPTH FOR TW...
Channel Type: Chn-Circular
Channel ID: Chn-Cir - 1

Solution to Mannings Open Channel Flow Equation
(Computed values are based on normal depth.)

CIRCULAR CROSS SECTION

Slope = .005000 ft/ft
Mannings n = 0.01300
Invert Elev. = 397.00 ft
Top of Channel = 400.00 ft
Diameter = 3.0000 ft

Name.... DETENTION 1
File.... C:\Shap_Ass\Active Projects\Warner Ranch\3rd Submital\Pond Pack\BMP 1\5508RPL4-100 YR-BMP 1.PPW

LEVEL POOL ROUTING DATA

HYG Dir = C:\Shap_Ass\Active Projects\Warner Ranch\3rd Submital\Pond Pack\BMP 1\
Inflow HYG file = NONE STORED - DETENTION 1 IN 100
Outflow HYG file = NONE STORED - DETENTION 1 OUT 100

Pond Node Data = DETENTION 1
Pond Volume Data = DETENTION 1
Pond Outlet Data = Outlet 1

Infiltration = .1000 in/hr

INITIAL CONDITIONS

Starting WS Elev	=	405.00 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	1.00 min

Elevation ft	Outflow cfs	Storage cu.ft	Area sq.ft	Infilt. cfs	Q Total cfs	2S/t + O cfs
405.00	.00	0	33800	.00	.00	.00
405.50	.30	17251	35211	.08	.38	575.42
406.00	.48	35215	36650	.08	.56	1174.41
406.50	.61	53906	38119	.09	.70	1797.58
407.00	.72	73339	39617	.09	.81	2445.45
407.25	.76	83339	40377	.09	.86	2778.80
407.50	1.06	93529	41144	.10	1.16	3118.77
408.00	3.00	114488	42700	.10	3.10	3819.37
408.20	4.17	123091	43320	.10	4.27	4107.29
408.50	14.22	136227	44258	.10	14.32	4555.20
409.00	44.38	158751	45844	.11	44.49	5336.18
409.50	83.30	182076	47458	.11	83.41	6152.59
410.00	102.38	206214	49100	.11	102.49	6976.28

LEVEL POOL ROUTING SUMMARY

HYG Dir = C:\Shap_Ass\Active Projects\Warner Ranch\3rd Submital\Pond Pack\BMP 1\
Inflow HYG file = NONE STORED - DETENTION 1 IN 100
Outflow HYG file = NONE STORED - DETENTION 1 OUT 100

Pond Node Data = DETENTION 1
Pond Volume Data = DETENTION 1
Pond Outlet Data = Outlet 1

Infiltration = .1000 in/hr

INITIAL CONDITIONS

Starting WS Elev	=	405.00 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	1.00 min

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	83.02 cfs	at	255.00 min
Peak Outflow	=	36.61 cfs	at	265.00 min
Peak Infiltration	=	.11 cfs	at	265.00 min
Peak Elevation	=	408.87 ft		
Peak Storage	=	152870 cu.ft		

MASS BALANCE (cu.ft)

+ Initial Vol	=	0
+ HYG Vol IN	=	224628
- Infiltration	=	10617
- HYG Vol OUT	=	182388
- Retained Vol	=	31565
Unrouted Vol	=	-58 cu.ft (.026% of Inflow Volume)

WARNING: Outflow hydrograph truncated on right side.

DETENTION TIMES SUMMARY

HYG Dir = C:\Shap_Ass\Active Projects\Warner Ranch\3rd Submital\Pond Pack\BMP 1\
Inflow HYG file = NONE STORED - DETENTION 1 IN 100
Outflow HYG file = NONE STORED - DETENTION 1 OUT 100

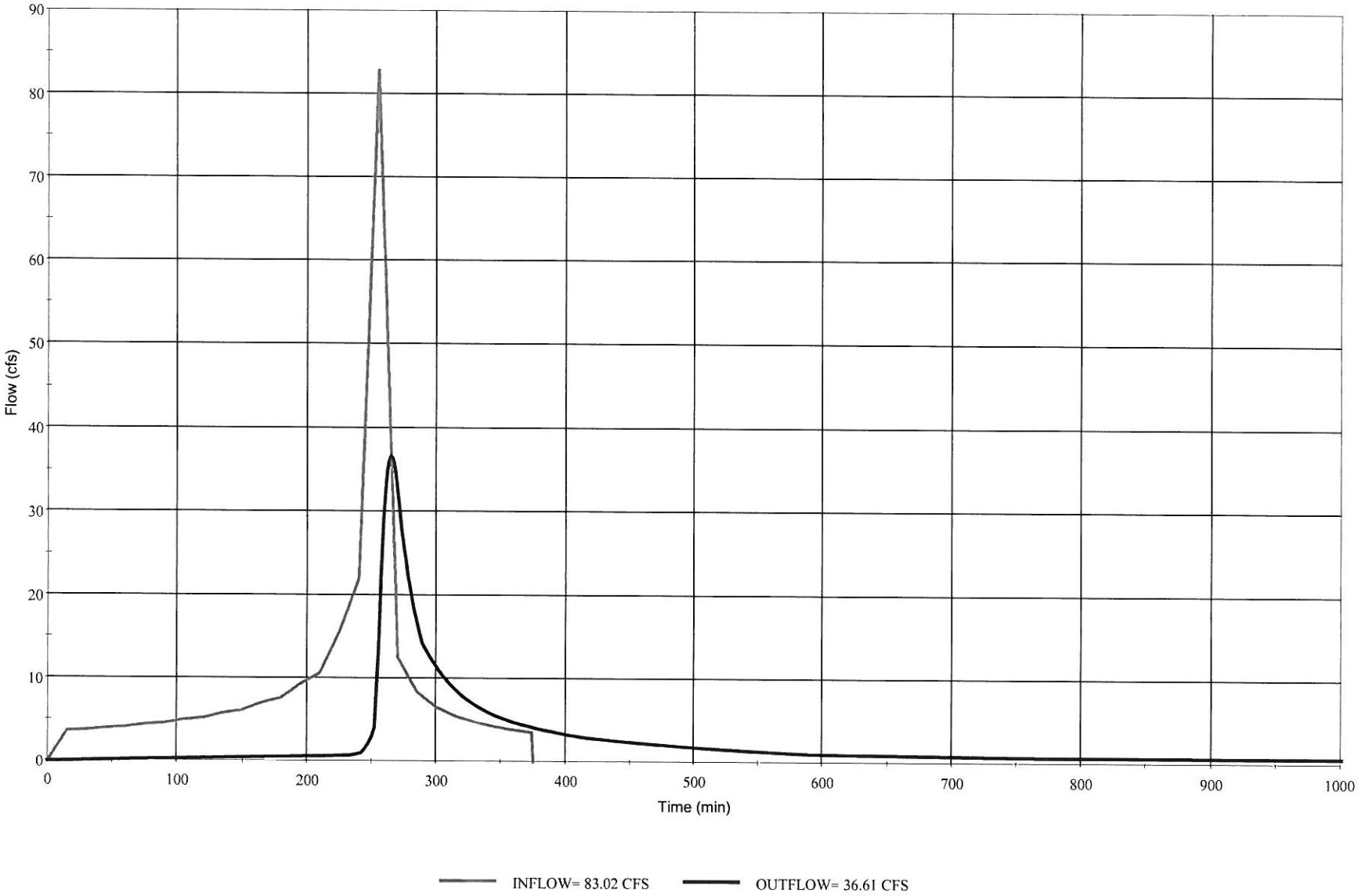
Pond Node Data = DETENTION 1
Pond Volume Data = DETENTION 1
Pond Outlet Data = Outlet 1

Infiltration = .1000 in/hr

APPROXIMATE DETENTION TIME

Tp, Outflow + Infilt.	=	265.00 min
Tp, Total Inflow	=	255.00 min
Peak to Peak	=	10.00 min
Qout+Infilt. Centroid	=	611.54 min
Inflow Centroid	=	221.52 min
Centroid to Centroid	=	390.03 min
Weighted Avg. Plug Time	=	597.13 min
Max.Plug Vol. Plug Time	=	568.76 min
Max.Inflow Plug Volume	=	4859 cu.ft (From 254.00 to 255.00 min)

NODE 21 - DETENTION POND - BMP 1
INFLOW/OUTFLOW HYDROGRAPH
100-YEAR STORM EVENT



Bio-Retention Pond-2

100-year Development Conditions

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 7.3

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
        Rational Hydrology Study        Date: 11/14/12
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********
WARNER RANCH
100-YEAR STORM EVENT DEVELOPMENT CONDITIONS
BIO-RETENTION POND 2
--------------------------------------------------------------------------
Shapouri & Associates, Rancho Santa Fe, CA - S/N   968
--------------------------------------------------------------------------
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       26.100 to Point/Station       26.200
**** INITIAL AREA EVALUATION ****
--------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(4.3 DU/A or Less        )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.480
Initial subarea total flow distance  =  448.600(Ft.)
Highest elevation =  470.000(Ft.)
Lowest elevation =  460.000(Ft.)
Elevation difference =   10.000(Ft.) Slope =  2.229 %
Top of Initial Area Slope adjusted by User to  1.700 %
Bottom of Initial Area Slope adjusted by User to  5.140 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 80.00 (Ft)
for the top area slope value of   1.70 %, in a development type of
 4.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   8.36 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4800)*(  80.000^.5)/(   1.700^(1/3)]=   8.36
The initial area total distance of  448.60 (Ft.) entered leaves a
remaining distance of  368.60 (Ft.)
Using Figure 3-4, the travel time for this distance is   2.32 minutes
for a distance of 368.60 (Ft.) and a slope of  5.14 %
with an elevation difference of  18.95(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    2.318 Minutes
Tt=[(11.9*0.0698^3)/( 18.95)]^.385=  2.32
Total initial area Ti =   8.36 minutes from Figure 3-3 formula plus
  2.32 minutes from the Figure 3-4 formula =  10.68 minutes
Rainfall intensity (I) =      5.652(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.480
Subarea runoff =      3.201(CFS)
Total initial stream area =        1.180(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.200 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
--------------------------------------------------------------------------
Upstream point/station elevation =   455.000(Ft.)
Downstream point/station elevation =   454.500(Ft.)
Pipe length =    11.90(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow =     3.201(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow =     3.201(CFS)
Normal flow depth in pipe =    4.58(In.)
Flow top width inside pipe =   18.87(In.)
Critical Depth =    7.50(In.)
Pipe flow velocity =      7.65(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    10.71 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       23.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
--------------------------------------------------------------------------
Upstream point/station elevation =   454.500(Ft.)
Downstream point/station elevation =   436.500(Ft.)
Pipe length =   266.25(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow =     3.201(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow =     3.201(CFS)
Normal flow depth in pipe =    4.08(In.)
Flow top width inside pipe =   18.03(In.)
Critical Depth =    7.50(In.)
Pipe flow velocity =      9.05(Ft/s)
Travel time through pipe =    0.49 min.
Time of concentration (TC) =    11.20 min.

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       23.000
**** CONFLUENCE OF MAIN STREAMS ****
--------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      1.180(Ac.)
Runoff from this stream =      3.201(CFS)
Time of concentration =   11.20 min.
Rainfall intensity =     5.482(In/Hr)
Program is now starting with Main Stream No. 2
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       27.100 to Point/Station       27.200
**** INITIAL AREA EVALUATION ****

------------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                    ]
(4.3 DU/A or Less       )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.480
Initial subarea total flow distance  =  598.000(Ft.)
Highest elevation =  470.000(Ft.)
Lowest elevation =  442.000(Ft.)
Elevation difference =   28.000(Ft.) Slope =  4.682 %
Top of Initial Area Slope adjusted by User to  1.830 %
Bottom of Initial Area Slope adjusted by User to  6.910 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 80.00 (Ft)
for the top area slope value of   1.83 %, in a development type of
 4.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   8.16 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4800)*(  80.000^.5)/(   1.830^(1/3)]=   8.16
The initial area total distance of  598.00 (Ft.) entered leaves a
remaining distance of  518.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   2.69 minutes
for a distance of 518.00 (Ft.) and a slope of  6.91 %
with an elevation difference of  35.79(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    2.688 Minutes
Tt=[(11.9*0.0981^3)/( 35.79)]^.385=  2.69
Total initial area Ti =   8.16 minutes from Figure 3-3 formula plus
  2.69 minutes from the Figure 3-4 formula =  10.85 minutes
Rainfall intensity (I) =      5.595(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.480
Subarea runoff =      3.706(CFS)
Total initial stream area =        1.380(Ac.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       27.200 to Point/Station       23.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

------------------------------------------------------------------------------
Upstream point/station elevation =   437.000(Ft.)
Downstream point/station elevation =   436.500(Ft.)
Pipe length =    26.25(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow =     3.706(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow =     3.706(CFS)
Normal flow depth in pipe =    6.00(In.)
Flow top width inside pipe =   20.78(In.)
Critical Depth =    8.08(In.)
Pipe flow velocity =      6.03(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    10.92 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       27.200 to Point/Station       23.000
**** CONFLUENCE OF MAIN STREAMS ****

------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.380(Ac.)
Runoff from this stream =      3.706(CFS)
Time of concentration =   10.92 min.
Rainfall intensity =     5.571(In/Hr)
Summary of stream data:

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


1         3.201     11.20           5.482
2         3.706     10.92           5.571
Qmax(1) =
            1.000 *    1.000 *     3.201) +
            0.984 *    1.000 *     3.706) + =       6.848
Qmax(2) =
            1.000 *    0.975 *     3.201) +
            1.000 *    1.000 *     3.706) + =       6.828

Total of 2 main streams to confluence:
Flow rates before confluence point:
     3.201       3.706
Maximum flow rates at confluence using above data:
     6.848       6.828
Area of streams before confluence:
     1.180       1.380


Results of confluence:
Total flow rate =      6.848(CFS)
Time of concentration =    11.198 min.
Effective stream area after confluence  =      2.560(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       24.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

------------------------------------------------------------------------------
Upstream point/station elevation =   436.500(Ft.)
Downstream point/station elevation =   426.500(Ft.)
Pipe length =   131.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow =     6.848(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow =     6.848(CFS)
Normal flow depth in pipe =    5.76(In.)
Flow top width inside pipe =   20.50(In.)
Critical Depth =   11.14(In.)
Pipe flow velocity =     11.80(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =    11.38 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       24.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      2.560(Ac.)
Runoff from this stream =      6.848(CFS)
Time of concentration =   11.38 min.
Rainfall intensity =     5.424(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       28.100 to Point/Station       28.200
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(4.3 DU/A or Less       )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.480
Initial subarea total flow distance  =  471.780(Ft.)
Highest elevation =  460.000(Ft.)
Lowest elevation =  433.000(Ft.)
Elevation difference =   27.000(Ft.) Slope =  5.723 %
Top of Initial Area Slope adjusted by User to  2.000 %
Bottom of Initial Area Slope adjusted by User to  7.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 80.00 (Ft)
for the top area slope value of   2.00 %, in a development type of
 4.3 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*(1.1-0.4800)*(  80.000^.5)/(   2.000^(1/3)]=   7.92
The initial area total distance of  471.78 (Ft.) entered leaves a
remaining distance of  391.78 (Ft.)
Using Figure 3-4, the travel time for this distance is   2.16 minutes
for a distance of 391.78 (Ft.) and a slope of  7.00 %
with an elevation difference of  27.42(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    2.157 Minutes
Tt=[(11.9*0.0742^3)/( 27.42)]^.385=  2.16
Total initial area Ti =   7.92 minutes from Figure 3-3 formula plus
  2.16 minutes from the Figure 3-4 formula =  10.08 minutes
Rainfall intensity (I) =      5.867(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.480
Subarea runoff =      3.295(CFS)
Total initial stream area =       1.170(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       28.200 to Point/Station       24.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =   428.000(Ft.)
Downstream point/station elevation =   426.500(Ft.)
Pipe length =     9.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow =     3.295(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow =     3.295(CFS)
Normal flow depth in pipe =    3.32(In.)
Flow top width inside pipe =   16.58(In.)
Critical Depth =    7.61(In.)
Pipe flow velocity =     12.53(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =    10.09 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       28.200 to Point/Station       24.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.170(Ac.)
Runoff from this stream =      3.295(CFS)
Time of concentration =   10.09 min.
Rainfall intensity =     5.863(In/Hr)
Summary of stream data:

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


1         6.848      11.38           5.424
2         3.295      10.09           5.863
Qmax(1) =
            1.000 *     1.000 *     6.848) +
            0.925 *     1.000 *     3.295) + =        9.897
Qmax(2) =
            1.000 *     0.887 *     6.848) +
            1.000 *     1.000 *     3.295) + =        9.366

Total of 2 main streams to confluence:
Flow rates before confluence point:
      6.848       3.295
Maximum flow rates at confluence using above data:
      9.897       9.366
Area of streams before confluence:
      2.560       1.170


Results of confluence:
Total flow rate =      9.897(CFS)
Time of concentration =    11.383 min.
Effective stream area after confluence  =      3.730(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.000 to Point/Station       25.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =   426.500(Ft.)
Downstream point/station elevation =   404.500(Ft.)
Pipe length  =   288.15(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =     9.897(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =     9.897(CFS)
Normal flow depth in pipe =    6.95(In.)
Flow top width inside pipe =   21.77(In.)
Critical Depth =   13.50(In.)
Pipe flow velocity =     13.12(Ft/s)
Travel time through pipe =    0.37 min.
Time of concentration (TC) =    11.75 min.

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.000 to Point/Station       25.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      3.730(Ac.)
Runoff from this stream =      9.897(CFS)
Time of concentration =   11.75 min.
Rainfall intensity =     5.315(In/Hr)
Program is now starting with Main Stream No. 2

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       29.100 to Point/Station       29.200
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.100
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                 ]
(4.3 DU/A or Less       )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.477
Initial subarea total flow distance  =  359.770(Ft.)
Highest elevation =  432.000(Ft.)
Lowest elevation =  411.000(Ft.)
Elevation difference =   21.000(Ft.) Slope =  5.837 %
Top of Initial Area Slope adjusted by User to  2.000 %
Bottom of Initial Area Slope adjusted by User to  8.940 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 80.00 (Ft)
for the top area slope value of   2.00 %, in a development type of
 4.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.96 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4770)*(  80.000^.5)/(   2.000^(1/3)]=   7.96
The initial area total distance of  359.77 (Ft.) entered leaves a
remaining distance of  279.77 (Ft.)
Using Figure 3-4, the travel time for this distance is   1.51 minutes
for a distance of 279.77 (Ft.) and a slope of  8.94 %
with an elevation difference of  25.01(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    1.515 Minutes
Tt=[(11.9*0.0530^3)/( 25.01)]^.385=  1.51
Total initial area Ti =   7.96 minutes from Figure 3-3 formula plus
  1.51 minutes from the Figure 3-4 formula =   9.48 minutes
Rainfall intensity (I) =     6.106(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.477
Subarea runoff =      2.359(CFS)
Total initial stream area =       0.810(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       29.200 to Point/Station       25.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =   406.000(Ft.)
Downstream point/station elevation =   404.500(Ft.)
Pipe length  =     9.92(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =     2.359(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =     2.359(CFS)
Normal flow depth in pipe =    2.90(In.)
Flow top width inside pipe =   15.64(In.)
Critical Depth =    6.39(In.)
Pipe flow velocity =     10.96(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =     9.49 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       29.200 to Point/Station       25.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.810(Ac.)
Runoff from this stream =      2.359(CFS)
Time of concentration =    9.49 min.
Rainfall intensity =     6.099(In/Hr)
Summary of stream data:

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


1         9.897      11.75           5.315
2         2.359       9.49           6.099
Qmax(1) =
            1.000 *     1.000 *     9.897) +
            0.871 *     1.000 *     2.359) + =       11.952
Qmax(2) =
            1.000 *     0.808 *     9.897) +
            1.000 *     1.000 *     2.359) + =       10.354
```

```
Total of 2 main streams to confluence:
Flow rates before confluence point:
      9.897       2.359
Maximum flow rates at confluence using above data:
     11.952      10.354
Area of streams before confluence:
      3.730       0.810


Results of confluence:
Total flow rate =     11.952(CFS)
Time of concentration =    11.749 min.
Effective stream area after confluence  =      4.540(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.000 to Point/Station       28.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   404.500(Ft.)
Downstream point/station elevation =   386.500(Ft.)
Pipe length  =   201.65(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =    11.952(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =    11.952(CFS)
Normal flow depth in pipe =    7.35(In.)
Flow top width inside pipe =   22.13(In.)
Critical Depth =   14.91(In.)
Pipe flow velocity =     14.64(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =    11.98 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.000 to Point/Station       28.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      4.540(Ac.)
Runoff from this stream =     11.952(CFS)
Time of concentration =   11.98 min.
Rainfall intensity =     5.249(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.100 to Point/Station       30.200
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                 ]
(4.3 DU/A or Less       )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.480
Initial subarea total flow distance  =  531.500(Ft.)
Highest elevation =  478.000(Ft.)
Lowest elevation =  448.000(Ft.)
Elevation difference =   30.000(Ft.) Slope =  5.644 %
Top of Initial Area Slope adjusted by User to  1.370 %
Bottom of Initial Area Slope adjusted by User to 10.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)
for the top area slope value of   1.37 %, in a development type of
 4.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   8.41 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4800)*(  70.000^.5)/(   1.370^(1/3)]=   8.41
The initial area total distance of  531.50 (Ft.) entered leaves a
remaining distance of  461.50 (Ft.)
Using Figure 3-4, the travel time for this distance is   2.13 minutes
for a distance of 461.50 (Ft.) and a slope of 10.00 %
with an elevation difference of  46.15(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    2.133 Minutes
Tt=[(11.9*0.0874^3)/( 46.15)]^.385=  2.13
Total initial area Ti =   8.41 minutes from Figure 3-3 formula plus
  2.13 minutes from the Figure 3-4 formula =  10.54 minutes
Rainfall intensity (I) =      5.700(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.480
Subarea runoff =      3.749(CFS)
Total initial stream area =       1.370(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.200 to Point/Station       26.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   443.000(Ft.)
Downstream point/station elevation =   439.500(Ft.)
Pipe length  =    37.34(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =     3.749(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =     3.749(CFS)
Normal flow depth in pipe =    4.07(In.)
Flow top width inside pipe =   18.01(In.)
Critical Depth =    8.14(In.)
Pipe flow velocity =     10.64(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    10.60 min.
```

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Process from Point/Station       30.200 to Point/Station       26.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.370(Ac.)
Runoff from this stream =      3.749(CFS)
Time of concentration =   10.60 min.
Rainfall intensity =     5.680(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.100 to Point/Station       31.200
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.100
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                 ]
(4.3 DU/A or Less       )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.477
Initial subarea total flow distance  =  553.370(Ft.)
Highest elevation =  480.000(Ft.)
Lowest elevation =  446.000(Ft.)
Elevation difference =   34.000(Ft.) Slope =  6.144 %
Top of Initial Area Slope adjusted by User to  1.330 %
Bottom of Initial Area Slope adjusted by User to 10.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)
for the top area slope value of   1.33 %, in a development type of
 4.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   8.53 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4770)*(  70.000^.5)/(   1.330^(1/3)]=   8.53
The initial area total distance of  553.37 (Ft.) entered leaves a
remaining distance of  483.37 (Ft.)
Using Figure 3-4, the travel time for this distance is   2.21 minutes
for a distance of 483.37 (Ft.) and a slope of 10.00 %
with an elevation difference of  48.34(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    2.210 Minutes
Tt=[(11.9*0.0915^3)/( 48.34)]^.385=  2.21
Total initial area Ti =   8.53 minutes from Figure 3-3 formula plus
  2.21 minutes from the Figure 3-4 formula =  10.74 minutes
Rainfall intensity (I) =      5.631(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.477
Subarea runoff =      6.017(CFS)
Total initial stream area =       2.240(Ac.)
```

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Process from Point/Station       31.200 to Point/Station       26.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =   441.000(Ft.)
Downstream point/station elevation =   439.500(Ft.)
Pipe length =    11.90(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow =     6.017(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow =     6.017(CFS)
Normal flow depth in pipe =    4.77(In.)
Flow top width inside pipe =   19.15(In.)
Critical Depth =   10.41(In.)
Pipe flow velocity =     13.58(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =    10.76 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.200 to Point/Station       26.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      2.240(Ac.)
Runoff from this stream =      6.017(CFS)
Time of concentration =   10.76 min.
Rainfall intensity =     5.626(In/Hr)
Summary of stream data:

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


1         3.749      10.60           5.680
2         6.017      10.76           5.626
Qmax(1) =
            1.000 *     1.000 *     3.749) +
            1.000 *     0.985 *     6.017) + =        9.677
Qmax(2) =
            0.990 *     1.000 *     3.749) +
            1.000 *     1.000 *     6.017) + =        9.730

Total of 2 streams to confluence:
Flow rates before confluence point:
       3.749       6.017
Maximum flow rates at confluence using above data:
       9.677       9.730
Area of streams before confluence:
       1.370       2.240
Results of confluence:
Total flow rate =      9.730(CFS)
Time of concentration =    10.757 min.
Effective stream area after confluence =      3.610(Ac.)
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Process from Point/Station       26.000 to Point/Station       27.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =    439.500(Ft.)
Downstream point/station elevation =    392.500(Ft.)
Pipe length  =    497.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =     9.730(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =     9.730(CFS)
Normal flow depth in pipe =     6.52(In.)
Flow top width inside pipe =    21.35(In.)
Critical Depth =    13.37(In.)
Pipe flow velocity =     14.10(Ft/s)
Travel time through pipe =     0.59 min.
Time of concentration (TC) =     11.34 min.


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Process from Point/Station       26.000 to Point/Station       27.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      3.610(Ac.)
Runoff from this stream =      9.730(CFS)
Time of concentration =   11.34 min.
Rainfall intensity =     5.436(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.100 to Point/Station       32.200
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.800
Decimal fraction soil group C = 0.200
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                 ]
(4.3 DU/A or Less       )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.456
Initial subarea total flow distance  =  590.500(Ft.)
Highest elevation =  448.000(Ft.)
Lowest elevation =  398.000(Ft.)
Elevation difference =   50.000(Ft.) Slope =  8.467 %
Top of Initial Area Slope adjusted by User to  2.000 %
Bottom of Initial Area Slope adjusted by User to 10.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 80.00 (Ft)
for the top area slope value of   2.00 %, in a development type of
 4.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   8.23 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4560)*(  80.000^.5)/(   2.000^(1/3)]=   8.23
The initial area total distance of  590.50 (Ft.) entered leaves a
remaining distance of  510.50 (Ft.)
Using Figure 3-4, the travel time for this distance is   2.31 minutes
for a distance of 510.50 (Ft.) and a slope of 10.00 %
with an elevation difference of  51.05(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    2.305 Minutes
Tt=[(11.9*0.0967^3)/( 51.05)]^.385=  2.31
Total initial area Ti =   8.23 minutes from Figure 3-3 formula plus
  2.31 minutes from the Figure 3-4 formula =  10.53 minutes
Rainfall intensity (I) =      5.702(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.456
Subarea runoff =      3.016(CFS)
Total initial stream area =       1.160(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.200 to Point/Station       27.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =    393.000(Ft.)
Downstream point/station elevation =    392.500(Ft.)
Pipe length  =     25.96(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =     3.016(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =     3.016(CFS)
Normal flow depth in pipe =     5.40(In.)
Flow top width inside pipe =    20.04(In.)
Critical Depth =     7.26(In.)
Pipe flow velocity =      5.71(Ft/s)
Travel time through pipe =     0.08 min.
Time of concentration (TC) =     10.61 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.200 to Point/Station       27.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.160(Ac.)
Runoff from this stream =      3.016(CFS)
Time of concentration =   10.61 min.
Rainfall intensity =     5.676(In/Hr)


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Process from Point/Station       33.100 to Point/Station       33.200
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.900
Decimal fraction soil group C = 0.100
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                 ]
(4.3 DU/A or Less       )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.453
Initial subarea total flow distance  =  493.500(Ft.)
Highest elevation =  446.000(Ft.)
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```
Lowest elevation =  398.000(Ft.)
Elevation difference =   48.000(Ft.) Slope =  9.726 %
Top of Initial Area Slope adjusted by User to 10.000 %
Bottom of Initial Area Slope adjusted by User to 10.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  10.00 %, in a development type of
 4.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.41 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4530)*( 100.000^.5)/(  10.000^(1/3)]=   5.41
The initial area total distance of  493.50 (Ft.) entered leaves a
remaining distance of  393.50 (Ft.)
Using Figure 3-4, the travel time for this distance is   1.89 minutes
for a distance of 393.50 (Ft.) and a slope of 10.00 %
with an elevation difference of  39.35(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =   1.887 Minutes
Tt=[(11.9*0.0745^3)/( 39.35)]^.385=  1.89
Total initial area Ti =   5.41 minutes from Figure 3-3 formula plus
  1.89 minutes from the Figure 3-4 formula =   7.29 minutes
Rainfall intensity (I) =      7.229(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.453
Subarea runoff =      7.237(CFS)
Total initial stream area =        2.210(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       33.200 to Point/Station       27.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   393.000(Ft.)
Downstream point/station elevation =   392.500(Ft.)
Pipe length =     9.90(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow =     7.237(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow =     7.237(CFS)
Normal flow depth in pipe =    6.58(In.)
Flow top width inside pipe =   21.41(In.)
Critical Depth =   11.46(In.)
Pipe flow velocity =     10.35(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =     7.31 min.


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Process from Point/Station       33.200 to Point/Station       27.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 3
Stream flow area =      2.210(Ac.)
Runoff from this stream =      7.237(CFS)
Time of concentration =    7.31 min.
Rainfall intensity =     7.219(In/Hr)
Summary of stream data:

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

1         9.730      11.34            5.436
2         3.016      10.61            5.676
3         7.237       7.31            7.219
Qmax(1) =
            1.000 *    1.000 *     9.730) +
            0.958 *    1.000 *     3.016) +
            0.753 *    1.000 *     7.237) + =       18.069
Qmax(2) =
            1.000 *    0.935 *     9.730) +
            1.000 *    1.000 *     3.016) +
            0.786 *    1.000 *     7.237) + =       17.807
Qmax(3) =
            1.000 *    0.644 *     9.730) +
            1.000 *    0.689 *     3.016) +
            1.000 *    1.000 *     7.237) + =       15.583

Total of 3 streams to confluence:
Flow rates before confluence point:
      9.730       3.016       7.237
Maximum flow rates at confluence using above data:
      18.069      17.807      15.583
Area of streams before confluence:
       3.610       1.160       2.210
Results of confluence:
Total flow rate =     18.069(CFS)
Time of concentration =    11.344 min.
Effective stream area after confluence =      6.980(Ac.)


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Process from Point/Station       27.000 to Point/Station       28.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   392.500(Ft.)
Downstream point/station elevation =   386.500(Ft.)
Pipe length =    73.04(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow =    18.069(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow =    18.069(CFS)
Normal flow depth in pipe =    9.36(In.)
Flow top width inside pipe =   23.41(In.)
Critical Depth =   18.38(In.)
Pipe flow velocity =     15.93(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    11.42 min.
```

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Process from Point/Station       27.000 to Point/Station       28.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      6.980(Ac.)
Runoff from this stream =     18.069(CFS)
Time of concentration =   11.42 min.
Rainfall intensity =     5.413(In/Hr)
Summary of stream data:

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


1       11.952     11.98           5.249
2       18.069     11.42           5.413
Qmax(1) =
           1.000 *    1.000 *    11.952) +
           0.970 *    1.000 *    18.069) + =      29.474
Qmax(2) =
           1.000 *    0.953 *    11.952) +
           1.000 *    1.000 *    18.069) + =      29.465

Total of 2 main streams to confluence:
Flow rates before confluence point:
     11.952      18.069
Maximum flow rates at confluence using above data:
      29.474       29.465
Area of streams before confluence:
       4.540        6.980


Results of confluence:
Total flow rate =     29.474(CFS)
Time of concentration =    11.978 min.
Effective stream area after confluence  =     11.520(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       28.000 to Point/Station       35.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =   386.500(Ft.)
Downstream point/station elevation =   372.000(Ft.)
Pipe length  =   204.90(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =    29.474(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =    29.474(CFS)
Normal flow depth in pipe =   12.91(In.)
Flow top width inside pipe =   23.93(In.)
Critical Depth =   22.26(In.)
Pipe flow velocity =     17.11(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =    12.18 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       28.000 to Point/Station       35.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     11.520(Ac.)
Runoff from this stream =     29.474(CFS)
Time of concentration =   12.18 min.
Rainfall intensity =     5.193(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       36.100 to Point/Station       36.200
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.700
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.300
[HIGH DENSITY RESIDENTIAL                    ]
(24.0 DU/A or Less       )
Impervious value, Ai = 0.650
Sub-Area C Value = 0.682
Initial subarea total flow distance  =  584.900(Ft.)
Highest elevation =  412.500(Ft.)
Lowest elevation =  394.000(Ft.)
Elevation difference =   18.500(Ft.) Slope =  3.163 %
Top of Initial Area Slope adjusted by User to  3.600 %
Bottom of Initial Area Slope adjusted by User to  2.310 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   3.60 %, in a development type of
 24.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.66 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6820)*(  90.000^.5)/(   3.600^(1/3)]=   4.66
The initial area total distance of  584.90 (Ft.) entered leaves a
remaining distance of  494.90 (Ft.)
Using Figure 3-4, the travel time for this distance is   3.96 minutes
for a distance of 494.90 (Ft.) and a slope of  2.31 %
with an elevation difference of  11.43(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    3.957 Minutes
Tt=[(11.9*0.0937^3)/( 11.43)]^.385=  3.96
Total initial area Ti =   4.66 minutes from Figure 3-3 formula plus
  3.96 minutes from the Figure 3-4 formula =   8.61 minutes
Rainfall intensity (I) =      6.493(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.682
Subarea runoff =     11.955(CFS)
Total initial stream area =        2.700(Ac.)
```

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Process from Point/Station       36.200 to Point/Station       30.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

------------------------------------------------------------------------------
Upstream point/station elevation =    389.000(Ft.)
Downstream point/station elevation =    383.500(Ft.)
Pipe length  =    239.43(Ft.)    Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =    11.955(CFS)
Given pipe size =      24.00(In.)
Calculated individual pipe flow  =    11.955(CFS)
Normal flow depth in pipe =    10.59(In.)
Flow top width inside pipe =    23.83(In.)
Critical Depth =    14.91(In.)
Pipe flow velocity =       8.95(Ft/s)
Travel time through pipe =     0.45 min.
Time of concentration (TC) =      9.06 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       36.200 to Point/Station       30.000
**** CONFLUENCE OF MINOR STREAMS ****

------------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =       2.700(Ac.)
Runoff from this stream =      11.955(CFS)
Time of concentration =     9.06 min.
Rainfall intensity =      6.285(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       37.100 to Point/Station       37.200
**** INITIAL AREA EVALUATION ****

------------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.600
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.400
[HIGH DENSITY RESIDENTIAL                    ]
(24.0 DU/A or Less       )
Impervious value, Ai = 0.650
Sub-Area C Value = 0.686
Initial subarea total flow distance  =  450.690(Ft.)
Highest elevation =  395.500(Ft.)
Lowest elevation =  390.000(Ft.)
Elevation difference =     5.500(Ft.) Slope =  1.220 %
Top of Initial Area Slope adjusted by User to  1.200 %
Bottom of Initial Area Slope adjusted by User to  1.810 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 65.00 (Ft)
for the top area slope value of    1.20 %, in a development type of
 24.0 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*(1.1-0.6860)*(  65.000^.5)/(   1.200^(1/3)]=    5.65
The initial area total distance of  450.69 (Ft.) entered leaves a
remaining distance of  385.69 (Ft.)

Using Figure 3-4, the travel time for this distance is    3.59 minutes
for a distance of 385.69 (Ft.) and a slope of  1.81 %
with an elevation difference of    6.98(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    3.588 Minutes
Tt=[(11.9*0.0730^3)/(  6.98)]^.385=  3.59
Total initial area Ti =    5.65 minutes from Figure 3-3 formula plus
  3.59 minutes from the Figure 3-4 formula =    9.24 minutes
Rainfall intensity (I) =      6.205(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.686
Subarea runoff =      7.321(CFS)
Total initial stream area =       1.720(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       37.200 to Point/Station       30.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

------------------------------------------------------------------------------
Upstream point/station elevation =    385.000(Ft.)
Downstream point/station elevation =    383.500(Ft.)
Pipe length  =     9.90(Ft.)    Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =     7.321(CFS)
Given pipe size =      24.00(In.)
Calculated individual pipe flow  =     7.321(CFS)
Normal flow depth in pipe =     5.02(In.)
Flow top width inside pipe =    19.52(In.)
Critical Depth =    11.53(In.)
Pipe flow velocity =      15.35(Ft/s)
Travel time through pipe =     0.01 min.
Time of concentration (TC) =      9.25 min.


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Process from Point/Station       37.200 to Point/Station       30.000
**** CONFLUENCE OF MINOR STREAMS ****

------------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =       1.720(Ac.)
Runoff from this stream =       7.321(CFS)
Time of concentration =     9.25 min.
Rainfall intensity =      6.200(In/Hr)
Summary of stream data:

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


1        11.955       9.06            6.285
2         7.321       9.25            6.200
Qmax(1) =
            1.000 *     1.000 *    11.955) +
            1.000 *     0.979 *     7.321) + =       19.125
Qmax(2) =
            0.987 *     1.000 *    11.955) +
            1.000 *     1.000 *     7.321) + =       19.117

Total of 2 streams to confluence:
```

```
Flow rates before confluence point:
      11.955       7.321
Maximum flow rates at confluence using above data:
       19.125       19.117
Area of streams before confluence:
        2.700        1.720
Results of confluence:
Total flow rate =      19.125(CFS)
Time of concentration =      9.060 min.
Effective stream area after confluence =       4.420(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       31.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =    383.500(Ft.)
Downstream point/station elevation =    380.000(Ft.)
Pipe length  =    246.76(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =     19.125(CFS)
Given pipe size =      24.00(In.)
Calculated individual pipe flow  =     19.125(CFS)
Normal flow depth in pipe =    16.52(In.)
Flow top width inside pipe =    22.23(In.)
Critical Depth =    18.88(In.)
Pipe flow velocity =       8.29(Ft/s)
Travel time through pipe =     0.50 min.
Time of concentration (TC) =      9.56 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       31.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =       4.420(Ac.)
Runoff from this stream =      19.125(CFS)
Time of concentration =     9.56 min.
Rainfall intensity =      6.072(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       38.100 to Point/Station       38.200
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.100
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.900
[HIGH DENSITY RESIDENTIAL                    ]
(24.0 DU/A or Less       )
Impervious value, Ai = 0.650
Sub-Area C Value = 0.706
Initial subarea total flow distance  =  788.000(Ft.)
Highest elevation =  402.000(Ft.)
Lowest elevation =  385.500(Ft.)
Elevation difference =   16.500(Ft.) Slope =  2.094 %

Top of Initial Area Slope adjusted by User to  3.000 %
Bottom of Initial Area Slope adjusted by User to  1.810 %
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
 24.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.66 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7060)*(  90.000^.5)/(   3.000^(1/3)]=   4.66
The initial area total distance of  788.00 (Ft.) entered leaves a
remaining distance of  698.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   5.66 minutes
for a distance of 698.00 (Ft.) and a slope of  1.81 %
with an elevation difference of  12.63(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    5.664 Minutes
Tt=[(11.9*0.1322^3)/( 12.63)]^.385=  5.66
Total initial area Ti =   4.66 minutes from Figure 3-3 formula plus
  5.66 minutes from the Figure 3-4 formula =  10.33 minutes
Rainfall intensity (I) =      5.775(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.706
Subarea runoff =      8.644(CFS)
Total initial stream area =       2.120(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       38.200 to Point/Station       31.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =    380.500(Ft.)
Downstream point/station elevation =    380.000(Ft.)
Pipe length  =    27.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =      8.644(CFS)
Given pipe size =      24.00(In.)
Calculated individual pipe flow  =      8.644(CFS)
Normal flow depth in pipe =     9.40(In.)
Flow top width inside pipe =    23.43(In.)
Critical Depth =    12.58(In.)
Pipe flow velocity =       7.58(Ft/s)
Travel time through pipe =     0.06 min.
Time of concentration (TC) =     10.39 min.


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Process from Point/Station       38.200 to Point/Station       31.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =       2.120(Ac.)
Runoff from this stream =       8.644(CFS)
Time of concentration =    10.39 min.
Rainfall intensity =      5.754(In/Hr)
Summary of stream data:
```

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


1        19.125       9.56            6.072
2         8.644      10.39            5.754
Qmax(1) =
             1.000 *     1.000 *     19.125) +
             1.000 *     0.920 *      8.644) + =       27.077
Qmax(2) =
             0.948 *     1.000 *     19.125) +
             1.000 *     1.000 *      8.644) + =       26.766

Total of 2 streams to confluence:
Flow rates before confluence point:
      19.125       8.644
Maximum flow rates at confluence using above data:
       27.077       26.766
Area of streams before confluence:
        4.420        2.120
Results of confluence:
Total flow rate =      27.077(CFS)
Time of concentration =      9.556 min.
Effective stream area after confluence =       6.540(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.000 to Point/Station       32.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =    380.000(Ft.)
Downstream point/station elevation =    377.500(Ft.)
Pipe length =     84.47(Ft.)    Manning's N = 0.015
No. of pipes = 1  Required pipe flow =     27.077(CFS)
Given pipe size =      24.00(In.)
Calculated individual pipe flow =     27.077(CFS)
Normal flow depth in pipe =    16.29(In.)
Flow top width inside pipe =    22.41(In.)
Critical Depth =    21.73(In.)
Pipe flow velocity =      11.94(Ft/s)
Travel time through pipe =     0.12 min.
Time of concentration (TC) =      9.67 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.000 to Point/Station       32.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =       6.540(Ac.)
Runoff from this stream =      27.077(CFS)
Time of concentration =     9.67 min.
Rainfall intensity =      6.024(In/Hr)
```

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Process from Point/Station       29.000 to Point/Station       32.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.500
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.500
[HIGH DENSITY RESIDENTIAL                    ]
(24.0 DU/A or Less       )
Impervious value, Ai = 0.650
Sub-Area C Value = 0.690
Rainfall intensity (I) =      5.811(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  10.23 min.  Rain intensity =       5.81(In/Hr)
Total area =       1.540(Ac.)  Total runoff =     6.766(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       29.000 to Point/Station       32.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =       1.540(Ac.)
Runoff from this stream =      6.766(CFS)
Time of concentration =    10.23 min.
Rainfall intensity =      5.811(In/Hr)
Summary of stream data:

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


1        27.077       9.67            6.024
2         6.766      10.23            5.811
Qmax(1) =
             1.000 *     1.000 *     27.077) +
             1.000 *     0.946 *      6.766) + =       33.475
Qmax(2) =
             0.965 *     1.000 *     27.077) +
             1.000 *     1.000 *      6.766) + =       32.885

Total of 2 streams to confluence:
Flow rates before confluence point:
      27.077       6.766
Maximum flow rates at confluence using above data:
       33.475       32.885
Area of streams before confluence:
        6.540        1.540
Results of confluence:
Total flow rate =      33.475(CFS)
Time of concentration =      9.674 min.
Effective stream area after confluence =       8.080(Ac.)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.000 to Point/Station       33.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =    377.500(Ft.)
Downstream point/station elevation =    375.500(Ft.)
Pipe length =    275.13(Ft.)    Manning's N = 0.015
No. of pipes = 1  Required pipe flow =     33.475(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow =     33.475(CFS)
Normal flow depth in pipe =    21.75(In.)
Flow top width inside pipe =    35.21(In.)
Critical Depth =    22.53(In.)
Pipe flow velocity =      7.49(Ft/s)
Travel time through pipe =     0.61 min.
Time of concentration (TC) =     10.29 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.000 to Point/Station       33.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      8.080(Ac.)
Runoff from this stream =     33.475(CFS)
Time of concentration =   10.29 min.
Rainfall intensity =     5.791(In/Hr)


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Process from Point/Station       39.100 to Point/Station       39.200
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.800
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.200
[HIGH DENSITY RESIDENTIAL                    ]
(24.0 DU/A or Less       )
Impervious value, Ai = 0.650
Sub-Area C Value = 0.678
Initial subarea total flow distance  =  574.000(Ft.)
Highest elevation =  390.000(Ft.)
Lowest elevation =  382.000(Ft.)
Elevation difference =     8.000(Ft.) Slope =  1.394 %
Top of Initial Area Slope adjusted by User to  1.730 %
Bottom of Initial Area Slope adjusted by User to  1.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 75.00 (Ft)
for the top area slope value of    1.73 %, in a development type of
 24.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.48 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6780)*(  75.000^.5)/(   1.730^(1/3)]=   5.48
The initial area total distance of  574.00 (Ft.) entered leaves a
remaining distance of  499.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   5.50 minutes
for a distance of 499.00 (Ft.) and a slope of  1.00 %
with an elevation difference of   4.99(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    5.497 Minutes
Tt=[(11.9*0.0945^3)/(  4.99)]^.385=  5.50
Total initial area Ti =   5.48 minutes from Figure 3-3 formula plus
  5.50 minutes from the Figure 3-4 formula =  10.98 minutes
Rainfall intensity (I) =     5.553(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.678
Subarea runoff =      8.170(CFS)
Total initial stream area =       2.170(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       39.200 to Point/Station       33.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =    377.000(Ft.)
Downstream point/station elevation =    375.500(Ft.)
Pipe length =     9.45(Ft.)    Manning's N = 0.015
No. of pipes = 1  Required pipe flow =     8.170(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow =     8.170(CFS)
Normal flow depth in pipe =     5.24(In.)
Flow top width inside pipe =    19.83(In.)
Critical Depth =    12.21(In.)
Pipe flow velocity =     16.11(Ft/s)
Travel time through pipe =     0.01 min.
Time of concentration (TC) =     10.99 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       39.200 to Point/Station       33.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      2.170(Ac.)
Runoff from this stream =      8.170(CFS)
Time of concentration =   10.99 min.
Rainfall intensity =     5.550(In/Hr)


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Process from Point/Station       40.100 to Point/Station       40.200
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Decimal fraction soil group A = 0.400
Decimal fraction soil group B = 0.600
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(4.3 DU/A or Less        )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.434
Initial subarea total flow distance  =  350.000(Ft.)
Highest elevation =  384.500(Ft.)
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Lowest elevation =  382.000(Ft.)
Elevation difference =    2.500(Ft.) Slope =  0.714 %
Top of Initial Area Slope adjusted by User to  1.000 %
Bottom of Initial Area Slope adjusted by User to  1.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)
for the top area slope value of   1.00 %, in a development type of
 4.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =  10.03 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4340)*(  70.000^.5)/(   1.000^(1/3)]=  10.03
The initial area total distance of  350.00 (Ft.) entered leaves a
remaining distance of  280.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   3.52 minutes
for a distance of 280.00 (Ft.) and a slope of  1.00 %
with an elevation difference of   2.80(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    3.523 Minutes
Tt=[(11.9*0.0530^3)/(  2.80)]^.385=  3.52
Total initial area Ti =  10.03 minutes from Figure 3-3 formula plus
  3.52 minutes from the Figure 3-4 formula =  13.55 minutes
Rainfall intensity (I) =      4.847(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.434
Subarea runoff =      1.304(CFS)
Total initial stream area =        0.620(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       40.200 to Point/Station       33.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   377.000(Ft.)
Downstream point/station elevation =   375.500(Ft.)
Pipe length =    29.23(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow =     1.304(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow =     1.304(CFS)
Normal flow depth in pipe =    2.82(In.)
Flow top width inside pipe =   15.47(In.)
Critical depth could not be calculated.
Pipe flow velocity =      6.28(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    13.63 min.


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Process from Point/Station       40.200 to Point/Station       33.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 3
Stream flow area =      0.620(Ac.)
Runoff from this stream =      1.304(CFS)
Time of concentration =   13.63 min.
Rainfall intensity =     4.829(In/Hr)
Summary of stream data:
```

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	33.475	10.29	5.791
2	8.170	10.99	5.550
3	1.304	13.63	4.829

```
Qmax(1) =
          1.000 *    1.000 *   33.475) +
          1.000 *    0.936 *    8.170) +
          1.000 *    0.755 *    1.304) + =      42.109
Qmax(2) =
          0.958 *    1.000 *   33.475) +
          1.000 *    1.000 *    8.170) +
          1.000 *    0.806 *    1.304) + =      41.304
Qmax(3) =
          0.834 *    1.000 *   33.475) +
          0.870 *    1.000 *    8.170) +
          1.000 *    1.000 *    1.304) + =      36.331

Total of 3 streams to confluence:
Flow rates before confluence point:
     33.475       8.170       1.304
Maximum flow rates at confluence using above data:
      42.109      41.304      36.331
Area of streams before confluence:
       8.080       2.170       0.620
Results of confluence:
Total flow rate =     42.109(CFS)
Time of concentration =    10.286 min.
Effective stream area after confluence =     10.870(Ac.)


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Process from Point/Station       33.000 to Point/Station       34.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   375.500(Ft.)
Downstream point/station elevation =   373.500(Ft.)
Pipe length =   251.22(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow =    42.109(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow =    42.109(CFS)
Normal flow depth in pipe =   24.73(In.)
Flow top width inside pipe =   33.39(In.)
Critical Depth =   25.34(In.)
Pipe flow velocity =      8.14(Ft/s)
Travel time through pipe =    0.51 min.
Time of concentration (TC) =    10.80 min.
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Process from Point/Station       33.000 to Point/Station       34.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      10.870(Ac.)
Runoff from this stream =      42.109(CFS)
Time of concentration =    10.80 min.
Rainfall intensity =      5.611(In/Hr)


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Process from Point/Station       41.100 to Point/Station       41.200
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.950
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.050
[HIGH DENSITY RESIDENTIAL                    ]
(24.0 DU/A or Less       )
Impervious value, Ai = 0.650
Sub-Area C Value = 0.672
Initial subarea total flow distance  =  527.700(Ft.)
Highest elevation =  408.000(Ft.)
Lowest elevation =  380.000(Ft.)
Elevation difference =   28.000(Ft.) Slope =  5.306 %
Top of Initial Area Slope adjusted by User to  5.000 %
Bottom of Initial Area Slope adjusted by User to  1.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 95.00 (Ft)
for the top area slope value of   5.00 %, in a development type of
 24.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.39 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6720)*(  95.000^.5)/(   5.000^(1/3)]=   4.39
The initial area total distance of  527.70 (Ft.) entered leaves a
remaining distance of  432.70 (Ft.)
Using Figure 3-4, the travel time for this distance is   4.93 minutes
for a distance of 432.70 (Ft.) and a slope of  1.00 %
with an elevation difference of   4.33(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    4.926 Minutes
Tt=[(11.9*0.0820^3)/(  4.33)]^.385=  4.93
Total initial area Ti =   4.39 minutes from Figure 3-3 formula plus
  4.93 minutes from the Figure 3-4 formula =   9.32 minutes
Rainfall intensity (I) =      6.173(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.672
Subarea runoff =      5.185(CFS)
Total initial stream area =       1.250(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       41.200 to Point/Station       34.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =   375.000(Ft.)
Downstream point/station elevation =   373.500(Ft.)
Pipe length =    21.70(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow =     5.185(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow =     5.185(CFS)
Normal flow depth in pipe =    5.14(In.)
Flow top width inside pipe =   19.69(In.)
Critical Depth =    9.62(In.)
Pipe flow velocity =     10.51(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     9.35 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       41.200 to Point/Station       34.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.250(Ac.)
Runoff from this stream =      5.185(CFS)
Time of concentration =    9.35 min.
Rainfall intensity =     6.158(In/Hr)
Summary of stream data:

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


1       42.109      10.80           5.611
2        5.185       9.35           6.158
Qmax(1) =
            1.000 *    1.000 *    42.109) +
            0.911 *    1.000 *     5.185) + =      46.833
Qmax(2) =
            1.000 *    0.866 *    42.109) +
            1.000 *    1.000 *     5.185) + =      41.642

Total of 2 streams to confluence:
Flow rates before confluence point:
     42.109       5.185
Maximum flow rates at confluence using above data:
      46.833       41.642
Area of streams before confluence:
      10.870        1.250
Results of confluence:
Total flow rate =     46.833(CFS)
Time of concentration =    10.801 min.
Effective stream area after confluence =     12.120(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       34.000 to Point/Station       35.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =    373.500(Ft.)
Downstream point/station elevation =    372.000(Ft.)
Pipe length  =    183.85(Ft.)    Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =     46.833(CFS)
Given pipe size =      36.00(In.)
Calculated individual pipe flow  =     46.833(CFS)
Normal flow depth in pipe =    26.63(In.)
Flow top width inside pipe =    31.60(In.)
Critical Depth =    26.75(In.)
Pipe flow velocity =       8.36(Ft/s)
Travel time through pipe =     0.37 min.
Time of concentration (TC) =     11.17 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       34.000 to Point/Station       35.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      12.120(Ac.)
Runoff from this stream =      46.833(CFS)
Time of concentration =    11.17 min.
Rainfall intensity =      5.492(In/Hr)
Summary of stream data:

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


1        29.474      12.18            5.193
2        46.833      11.17            5.492
Qmax(1) =
             1.000 *     1.000 *     29.474) +
             0.946 *     1.000 *     46.833) + =       73.762
Qmax(2) =
             1.000 *     0.917 *     29.474) +
             1.000 *     1.000 *     46.833) + =       73.862

Total of 2 main streams to confluence:
Flow rates before confluence point:
       29.474       46.833
Maximum flow rates at confluence using above data:
       73.762       73.862
Area of streams before confluence:
       11.520       12.120


Results of confluence:
Total flow rate =      73.862(CFS)
Time of concentration =     11.168 min.
Effective stream area after confluence  =      23.640(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       35.000 to Point/Station       36.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =    372.000(Ft.)
Downstream point/station elevation =    368.500(Ft.)
Pipe length  =    171.00(Ft.)    Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =     73.862(CFS)
Given pipe size =      36.00(In.)
Calculated individual pipe flow  =     73.862(CFS)
Normal flow depth in pipe =    26.53(In.)
Flow top width inside pipe =    31.70(In.)
Critical Depth =    32.48(In.)
Pipe flow velocity =      13.23(Ft/s)
Travel time through pipe =     0.22 min.
Time of concentration (TC) =     11.38 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       35.000 to Point/Station       36.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      23.640(Ac.)
Runoff from this stream =      73.862(CFS)
Time of concentration =    11.38 min.
Rainfall intensity =      5.424(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       42.100 to Point/Station       42.200
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Decimal fraction soil group A = 0.200
Decimal fraction soil group B = 0.500
Decimal fraction soil group C = 0.300
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                    ]
(4.3 DU/A or Less        )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.451
Initial subarea total flow distance  =  740.000(Ft.)
Highest elevation =  422.000(Ft.)
Lowest elevation =  374.000(Ft.)
Elevation difference =   48.000(Ft.) Slope =  6.486 %
Top of Initial Area Slope adjusted by User to  8.370 %
Bottom of Initial Area Slope adjusted by User to  3.500 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   8.37 %, in a development type of
 4.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.75 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4510)*( 100.000^.5)/(   8.370^(1/3)]=   5.75
```

```
The initial area total distance of  740.00 (Ft.) entered leaves a
remaining distance of  640.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   4.11 minutes
for a distance of 640.00 (Ft.) and a slope of  3.50 %
with an elevation difference of  22.40(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    4.110 Minutes
Tt=[(11.9*0.1212^3)/( 22.40)]^.385=  4.11
Total initial area Ti =   5.75 minutes from Figure 3-3 formula plus
  4.11 minutes from the Figure 3-4 formula =   9.86 minutes
Rainfall intensity (I) =      5.949(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.451
Subarea runoff =      4.508(CFS)
Total initial stream area =        1.680(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       42.200 to Point/Station       36.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   369.000(Ft.)
Downstream point/station elevation =   368.500(Ft.)
Pipe length =    20.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow =     4.508(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow =     4.508(CFS)
Normal flow depth in pipe =    6.18(In.)
Flow top width inside pipe =   20.99(In.)
Critical Depth =    8.94(In.)
Pipe flow velocity =      7.03(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =     9.91 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       42.200 to Point/Station       36.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.680(Ac.)
Runoff from this stream =      4.508(CFS)
Time of concentration =    9.91 min.
Rainfall intensity =     5.931(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       43.100 to Point/Station       43.200
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.700
Decimal fraction soil group C = 0.200
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL                 ]
(4.3 DU/A or Less       )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.452
Initial subarea total flow distance  =  667.700(Ft.)
Highest elevation =  410.000(Ft.)
Lowest elevation =  373.000(Ft.)
Elevation difference =   37.000(Ft.) Slope =  5.541 %
Top of Initial Area Slope adjusted by User to  2.000 %
Bottom of Initial Area Slope adjusted by User to  3.840 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 80.00 (Ft)
for the top area slope value of   2.00 %, in a development type of
 4.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   8.28 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4520)*(  80.000^.5)/(   2.000^(1/3)]=   8.28
The initial area total distance of  667.70 (Ft.) entered leaves a
remaining distance of  587.70 (Ft.)
Using Figure 3-4, the travel time for this distance is   3.71 minutes
for a distance of 587.70 (Ft.) and a slope of  3.84 %
with an elevation difference of  22.57(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    3.714 Minutes
Tt=[(11.9*0.1113^3)/( 22.57)]^.385=  3.71
Total initial area Ti =   8.28 minutes from Figure 3-3 formula plus
  3.71 minutes from the Figure 3-4 formula =  11.99 minutes
Rainfall intensity (I) =      5.244(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.452
Subarea runoff =      1.896(CFS)
Total initial stream area =        0.800(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       43.200 to Point/Station       36.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   369.000(Ft.)
Downstream point/station elevation =   368.500(Ft.)
Pipe length =    33.32(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow =     1.896(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow =     1.896(CFS)
Normal flow depth in pipe =    4.56(In.)
Flow top width inside pipe =   18.83(In.)
Critical Depth =    5.72(In.)
Pipe flow velocity =      4.56(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =    12.12 min.
```

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Process from Point/Station       43.200 to Point/Station       36.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =       0.800(Ac.)
Runoff from this stream =       1.896(CFS)
Time of concentration =    12.12 min.
Rainfall intensity =      5.210(In/Hr)
Summary of stream data:

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


1        73.862      11.38            5.424
2         4.508       9.91            5.931
3         1.896      12.12            5.210
Qmax(1) =
             1.000 *     1.000 *    73.862) +
             0.915 *     1.000 *     4.508) +
             1.000 *     0.939 *     1.896) + =       79.766
Qmax(2) =
             1.000 *     0.871 *    73.862) +
             1.000 *     1.000 *     4.508) +
             1.000 *     0.818 *     1.896) + =       70.372
Qmax(3) =
             0.961 *     1.000 *    73.862) +
             0.878 *     1.000 *     4.508) +
             1.000 *     1.000 *     1.896) + =       76.803

Total of 3 main streams to confluence:
Flow rates before confluence point:
      73.862       4.508       1.896
Maximum flow rates at confluence using above data:
       79.766       70.372       76.803
Area of streams before confluence:
       23.640       1.680       0.800


Results of confluence:
Total flow rate =      79.766(CFS)
Time of concentration =     11.383 min.
Effective stream area after confluence  =      26.120(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       36.000 to Point/Station       37.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =    368.500(Ft.)
Downstream point/station elevation =    368.000(Ft.)
Pipe length  =     66.44(Ft.)    Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =     79.766(CFS)
Given pipe size =      42.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     0.589(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =       0.556(Ft.)
 Minor friction loss =       0.534(Ft.)      K-factor =    0.50
Pipe flow velocity =       8.29(Ft/s)
Travel time through pipe =     0.13 min.
Time of concentration (TC) =     11.52 min.
End of computations, total study area =          26.120 (Ac.)
```

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                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 7.3

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
        Rational Hydrology Study         Date: 11/08/12
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********
WARNER RANCH
100-YEAR STORM EVENT DEVELOPMENT CONDITIONS
BIO-RETENTION POND 2
--------------------------------------------------------------------------
Shapouri & Associates, Rancho Santa Fe, CA - S/N   968
--------------------------------------------------------------------------
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       34.100 to Point/Station       34.200
**** INITIAL AREA EVALUATION ****

------------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.600
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.400
[HIGH DENSITY RESIDENTIAL                    ]
(24.0 DU/A or Less       )
Impervious value, Ai = 0.650
Sub-Area C Value = 0.686
Initial subarea total flow distance  =  339.000(Ft.)
Highest elevation =  388.000(Ft.)
Lowest elevation =  384.000(Ft.)
Elevation difference =    4.000(Ft.) Slope =  1.180 %
Top of Initial Area Slope adjusted by User to  1.000 %
Bottom 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
 24.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.01 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6860)*(  65.000^.5)/(   1.000^(1/3)]=   6.01
The initial area total distance of  339.00 (Ft.) entered leaves a
remaining distance of  274.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   3.46 minutes
for a distance of 274.00 (Ft.) and a slope of  1.00 %
with an elevation difference of   2.74(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    3.465 Minutes
Tt=[(11.9*0.0519^3)/(  2.74)]^.385=  3.46
Total initial area Ti =   6.01 minutes from Figure 3-3 formula plus
  3.46 minutes from the Figure 3-4 formula =   9.47 minutes
Rainfall intensity (I) =      6.107(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.686
Subarea runoff =      5.320(CFS)
Total initial stream area =      1.270(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       34.200 to Point/Station       29.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

------------------------------------------------------------------------------
Upstream point/station elevation =   379.000(Ft.)
Downstream point/station elevation =   378.500(Ft.)
Pipe length =     7.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow =     5.320(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow =     5.320(CFS)
Normal flow depth in pipe =    5.17(In.)
Flow top width inside pipe =   19.73(In.)
Critical Depth =    9.75(In.)
Pipe flow velocity =     10.71(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =     9.48 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       34.200 to Point/Station       29.000
**** CONFLUENCE OF MAIN STREAMS ****

------------------------------------------------------------------------------
The following data inside Main Stream is listed:

In Main Stream number: 1
Stream flow area =      1.270(Ac.)
Runoff from this stream =      5.320(CFS)
Time of concentration =    9.48 min.
Rainfall intensity =     6.102(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       35.100 to Point/Station       35.200
**** INITIAL AREA EVALUATION ****

------------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.500
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.500
[Street and Roads]
(Paved)
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Initial subarea total flow distance  =  357.550(Ft.)
Highest elevation =  387.000(Ft.)
Lowest elevation =  384.000(Ft.)
```

```
Elevation difference =     3.000(Ft.) Slope =  0.839 %
Top of Initial Area Slope adjusted by User to  1.000 %
Bottom of Initial Area Slope adjusted by User to  1.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
for the top area slope value of    1.00 %, in a development type of
 General Industrial
In Accordance With Figure 3-3
Initial Area Time of Concentration =    3.21 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8700)*(  60.000^.5)/(   1.000^(1/3)]=   3.21
The initial area total distance of  357.55 (Ft.) entered leaves a
remaining distance of  297.55 (Ft.)
Using Figure 3-4, the travel time for this distance is    3.69 minutes
for a distance of 297.55 (Ft.) and a slope of  1.00 %
with an elevation difference of    2.98(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =     3.692 Minutes
Tt=[(11.9*0.0564^3)/(  2.98)]^.385=  3.69
Total initial area Ti =    3.21 minutes from Figure 3-3 formula plus
  3.69 minutes from the Figure 3-4 formula =    6.90 minutes
Rainfall intensity (I) =       7.493(In/Hr) for a    100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff =       1.760(CFS)
Total initial stream area =        0.270(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       35.200 to Point/Station       29.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =    379.000(Ft.)
Downstream point/station elevation =    378.500(Ft.)
Pipe length  =     26.24(Ft.)    Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =      1.760(CFS)
Given pipe size =      24.00(In.)
Calculated individual pipe flow  =      1.760(CFS)
Normal flow depth in pipe =     4.15(In.)
Flow top width inside pipe =    18.15(In.)
Critical Depth =     5.51(In.)
Pipe flow velocity =       4.85(Ft/s)
Travel time through pipe =     0.09 min.
Time of concentration (TC) =      6.99 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       35.200 to Point/Station       29.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =       0.270(Ac.)
Runoff from this stream =       1.760(CFS)
Time of concentration =     6.99 min.
Rainfall intensity =      7.430(In/Hr)
Summary of stream data:

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

1         5.320       9.48            6.102
2         1.760       6.99            7.430
Qmax(1) =
            1.000 *     1.000 *      5.320) +
            0.821 *     1.000 *      1.760) + =        6.766
Qmax(2) =
            1.000 *     0.737 *      5.320) +
            1.000 *     1.000 *      1.760) + =        5.681

Total of 2 main streams to confluence:

Flow rates before confluence point:
       5.320       1.760
Maximum flow rates at confluence using above data:
        6.766       5.681
Area of streams before confluence:
        1.270       0.270


Results of confluence:
Total flow rate =       6.766(CFS)
Time of concentration =      9.484 min.
Effective stream area after confluence  =       1.540(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       29.000 to Point/Station       32.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =    378.500(Ft.)
Downstream point/station elevation =    377.500(Ft.)
Pipe length  =    198.28(Ft.)    Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =      6.766(CFS)
Given pipe size =      24.00(In.)
Calculated individual pipe flow  =      6.766(CFS)
Normal flow depth in pipe =    11.80(In.)
Flow top width inside pipe =    24.00(In.)
Critical Depth =    11.07(In.)
Pipe flow velocity =       4.40(Ft/s)
Travel time through pipe =     0.75 min.
Time of concentration (TC) =     10.23 min.
End of computations, total study area =            1.540 (Ac.)
```

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       San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 7.3

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
        Rational Hydrology Study        Date: 11/14/12
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********
WARNER RANCH
100-YEAR STORM EVENT DEVELOPMENT CONDITIONS
BIO-RETENTION POND 2
--------------------------------------------------------------------------
Shapouri & Associates, Rancho Santa Fe, CA - S/N   968
--------------------------------------------------------------------------
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       44.100 to Point/Station       38.000
**** INITIAL AREA EVALUATION ****
--------------------------------------------------------------------------
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.200
Initial subarea total flow distance  =  423.586(Ft.)
Highest elevation =  374.000(Ft.)
Lowest elevation =  367.000(Ft.)
Elevation difference =    7.000(Ft.) Slope =  1.653 %
Top of Initial Area Slope adjusted by User to  6.330 %
Bottom of Initial Area Slope adjusted by User to  0.300 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   6.33 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   8.76 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2000)*( 100.000^.5)/(   6.330^(1/3)]=   8.76
The initial area total distance of  423.59 (Ft.) entered leaves a
remaining distance of  323.59 (Ft.)
Using Figure 3-4, the travel time for this distance is   6.26 minutes
for a distance of 323.59 (Ft.) and a slope of  0.30 %
with an elevation difference of   0.97(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    6.260 Minutes
Tt=[(11.9*0.0613^3)/(  0.97)]^.385=  6.26
Total initial area Ti =   8.76 minutes from Figure 3-3 formula plus
  6.26 minutes from the Figure 3-4 formula =  15.02 minutes
Rainfall intensity (I) =      4.537(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.200
Subarea runoff =      2.922(CFS)
Total initial stream area =       3.220(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       44.100 to Point/Station       38.000
**** CONFLUENCE OF MAIN STREAMS ****
--------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      3.220(Ac.)
Runoff from this stream =      2.922(CFS)
Time of concentration =   15.02 min.
Rainfall intensity =     4.537(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       37.000 to Point/Station       38.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
--------------------------------------------------------------------------
Decimal fraction soil group A = 0.050
Decimal fraction soil group B = 0.460
Decimal fraction soil group C = 0.330
Decimal fraction soil group D = 0.160
[MEDIUM DENSITY RESIDENTIAL                 ]
(4.3 DU/A or Less       )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.469
Rainfall intensity (I) =      5.383(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  11.52 min.  Rain intensity =       5.38(In/Hr)
Total area =       26.120(Ac.)  Total runoff =    79.766(CFS)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       37.000 to Point/Station       38.000
**** CONFLUENCE OF MAIN STREAMS ****
```

```
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      26.120(Ac.)
Runoff from this stream =      79.766(CFS)
Time of concentration =    11.52 min.
Rainfall intensity =      5.383(In/Hr)
Summary of stream data:

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


1          2.922      15.02            4.537
2         79.766      11.52            5.383
Qmax(1) =
             1.000 *     1.000 *      2.922) +
             0.843 *     1.000 *     79.766) + =       70.149
Qmax(2) =
             1.000 *     0.767 *      2.922) +
             1.000 *     1.000 *     79.766) + =       82.007

Total of 2 main streams to confluence:
Flow rates before confluence point:
       2.922       79.766
Maximum flow rates at confluence using above data:
       70.149       82.007
Area of streams before confluence:
        3.220       26.120


Results of confluence:
Total flow rate =      82.007(CFS)
Time of concentration =     11.520 min.
Effective stream area after confluence  =      29.340(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       37.000 to Point/Station       38.000
**** 6 HOUR HYDROGRAPH ****
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003


Time of Concentration =  11.52
Basin Area =     29.34 Acres
6 Hour Rainfall =  3.500 Inches
Runoff Coefficient =  0.440
Peak Discharge =     82.01 CFS
     Time (Min)      Discharge (CFS)
          0               0.000
         11               2.688
         22               2.743
         33               2.862
         44               2.926
         55               3.067
         66               3.144
         77               3.314
         88               3.408
         99               3.619
        110               3.738
        121               4.008
        132               4.163
        143               4.525
        154               4.739
        165               5.256
        176               5.574
        187               6.389
        198               6.928
        209               8.468
        220               9.645
        231              14.161
        242              19.953
        253              82.007
        264              11.358
        275               7.599
        286               5.946
        297               4.980
        308               4.335
        319               3.867
        330               3.510
        341               3.226
        352               2.994
        363               2.801
```

Job File: C:\Shap_Ass\Active Projects\Warner Ranch\3rd Submital\Pond Pack\BMP 2\5508RPL4-100 YR-BMP 2.PPW
Rain Dir: C:\Shap_Ass\Active Projects\Warner Ranch\3rd Submital\Pond Pack\BMP 2\

==========
JOB TITLE
==========

Project Date: 11/23/2012
Project Engineer: Shapouri & Associates
Project Title: 5508rpl4
Project Comments:**NODE 38**
5508rpl4 - Detention Pond - BMP 2

S/N:
PondPack Ver: Compute Time: Date:

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