

\*\*\*\*\*  
 Process from Point/Station 58.200 to Point/Station 47.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 2  
 Stream flow area = 1.110 (Ac.)  
 Runoff from this stream = 2.512 (CFS)  
 Time of concentration = 13.04 min.  
 Rainfall intensity = 4.970 (In/Hr)  
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	11.621	15.31	4.480
2	2.512	13.04	4.970

Qmax(1) =  
 1.000 \* 1.000 \* 11.621) +  
 0.901 \* 1.000 \* 2.512) + = 13.885  
 Qmax(2) =  
 1.000 \* 0.851 \* 11.621) +  
 1.000 \* 1.000 \* 2.512) + = 12.405

Total of 2 main streams to confluence:

Flow rates before confluence point:

11.621	2.512
Maximum flow rates at confluence using above data:	
13.885	12.405
Area of streams before confluence:	
5.340	1.110

Results of confluence:

Total flow rate = 13.885 (CFS)  
 Time of concentration = 15.314 min.  
 Effective stream area after confluence = 6.450 (Ac.)

\*\*\*\*\*  
 Process from Point/Station 47.000 to Point/Station 48.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

Upstream point/station elevation = 363.500 (Ft.)  
 Downstream point/station elevation = 363.000 (Ft.)  
 Pipe length = 88.95 (Ft.) Manning's N = 0.015  
 No. of pipes = 1 Required pipe flow = 13.885 (CFS)  
 Given pipe size = 24.00 (In.)  
 Calculated individual pipe flow = 13.885 (CFS)  
 Normal flow depth in pipe = 18.56 (In.)  
 Flow top width inside pipe = 20.09 (In.)  
 Critical Depth = 16.11 (In.)  
 Pipe flow velocity = 5.32 (Ft/s)  
 Travel time through pipe = 0.28 min.  
 Time of concentration (TC) = 15.59 min.

\*\*\*\*\*  
 Process from Point/Station 47.000 to Point/Station 48.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 1  
 Stream flow area = 6.450 (Ac.)  
 Runoff from this stream = 13.885 (CFS)  
 Time of concentration = 15.59 min.  
 Rainfall intensity = 4.428 (In/Hr)  
 Program is now starting with Main Stream No. 2

\*\*\*\*\*  
 Process from Point/Station 59.100 to Point/Station 59.200  
 \*\*\*\* 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  
 [MEDIUM DENSITY RESIDENTIAL  
 (4.3 DU/A or Less )]  
 Impervious value, Ai = 0.300  
 Sub-Area C Value = 0.464  
 Initial subarea total flow distance = 549.400 (Ft.)  
 Highest elevation = 382.000 (Ft.)  
 Lowest elevation = 368.000 (Ft.)  
 Elevation difference = 14.000 (Ft.) Slope = 2.548 %  
 Top of Initial Area Slope adjusted by User to 2.000 %  
 Bottom of Initial Area Slope adjusted by User to 1.000 %  
 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 = 8.13 minutes  
 $TC = [1.8 * (1.1 - C) * distance (Ft.)^{.5}] / (\% slope^{(1/3)})]$   
 $TC = [1.8 * (1.1 - 0.4640) * (80.000^{.5}) / (2.000^{(1/3)})] = 8.13$   
 The initial area total distance of 549.40 (Ft.) entered leaves a  
 remaining distance of 469.40 (Ft.)  
 Using Figure 3-4, the travel time for this distance is 5.24 minutes  
 for a distance of 469.40 (Ft.) and a slope of 1.00 %  
 with an elevation difference of 4.69 (Ft.) from the end of the top area  
 $Tt = [11.9 * length (Mi)^3 / (elevation change (Ft.))]^{.385} * 60 (min/hr)$   
 $= 5.244 \text{ Minutes}$   
 $Tt = [(11.9 * 0.0889^3) / (4.69)]^{.385} = 5.24$   
 Total initial area Ti = 8.13 minutes from Figure 3-3 formula plus  
 5.24 minutes from the Figure 3-4 formula = 13.37 minutes  
 Rainfall intensity (I) = 4.889 (In/Hr) for a 100.0 year storm  
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.464  
 Subarea runoff = 3.380 (CFS)  
 Total initial stream area = 1.490 (Ac.)

\*\*\*\*\*  
 Process from Point/Station 59.200 to Point/Station 48.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

Upstream point/station elevation = 363.500(Ft.)  
 Downstream point/station elevation = 363.000(Ft.)  
 Pipe length = 8.35(Ft.) Manning's N = 0.015  
 No. of pipes = 1 Required pipe flow = 3.380(CFS)  
 Given pipe size = 24.00(In.)  
 Calculated individual pipe flow = 3.380(CFS)  
 Normal flow depth in pipe = 4.31(In.)  
 Flow top width inside pipe = 18.43(In.)  
 Critical Depth = 7.71(In.)  
 Pipe flow velocity = 8.81(Ft/s)  
 Travel time through pipe = 0.02 min.  
 Time of concentration (TC) = 13.39 min.

\*\*\*\*\*  
 Process from Point/Station 59.200 to Point/Station 48.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:  
 In Main Stream number: 2  
 Stream flow area = 1.490(Ac.)  
 Runoff from this stream = 3.380(CFS)  
 Time of concentration = 13.39 min.  
 Rainfall intensity = 4.886(In/Hr)  
 Program is now starting with Main Stream No. 3

\*\*\*\*\*  
 Process from Point/Station 60.100 to Point/Station 60.200  
 \*\*\*\* 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  
 [MEDIUM DENSITY RESIDENTIAL ]  
 (4.3 DU/A or Less )  
 Impervious value, Ai = 0.300  
 Sub-Area C Value = 0.471  
 Initial subarea total flow distance = 371.380(Ft.)  
 Highest elevation = 371.000(Ft.)  
 Lowest elevation = 368.000(Ft.)  
 Elevation difference = 3.000(Ft.) Slope = 0.808 %  
 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 = 9.47 minutes  
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})]$   
 $TC = [1.8 * (1.1 - 0.4710) * (70.000^{.5})] / (1.000^{(1/3)}) = 9.47$

The initial area total distance of 371.38 (Ft.) entered leaves a  
 remaining distance of 301.38 (Ft.)  
 Using Figure 3-4, the travel time for this distance is 3.73 minutes  
 for a distance of 301.38 (Ft.) and a slope of 1.00 %  
 with an elevation difference of 3.01(Ft.) from the end of the top area  
 $Tt = [11.9 * length(Mi)^3] / (elevation change(Ft.))^{.385} * 60(min/hr)$   
 = 3.728 Minutes  
 $Tt = [(11.9 * 0.0571^3) / (3.01)]^{.385} = 3.73$   
 Total initial area Ti = 9.47 minutes from Figure 3-3 formula plus  
 3.73 minutes from the Figure 3-4 formula = 13.20 minutes  
 Rainfall intensity (I) = 4.930(In/Hr) for a 100.0 year storm  
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.471  
 Subarea runoff = 2.090(CFS)  
 Total initial stream area = 0.900(Ac.)

\*\*\*\*\*  
 Process from Point/Station 60.200 to Point/Station 48.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

Upstream point/station elevation = 363.500(Ft.)  
 Downstream point/station elevation = 363.000(Ft.)  
 Pipe length = 25.27(Ft.) Manning's N = 0.015  
 No. of pipes = 1 Required pipe flow = 2.090(CFS)  
 Given pipe size = 24.00(In.)  
 Calculated individual pipe flow = 2.090(CFS)  
 Normal flow depth in pipe = 4.47(In.)  
 Flow top width inside pipe = 18.69(In.)  
 Critical depth could not be calculated.  
 Pipe flow velocity = 5.17(Ft/s)  
 Travel time through pipe = 0.08 min.  
 Time of concentration (TC) = 13.28 min.

\*\*\*\*\*  
 Process from Point/Station 60.200 to Point/Station 48.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:  
 In Main Stream number: 3  
 Stream flow area = 0.900(Ac.)  
 Runoff from this stream = 2.090(CFS)  
 Time of concentration = 13.28 min.  
 Rainfall intensity = 4.911(In/Hr)  
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	13.885	15.59	4.428
2	3.380	13.39	4.886
3	2.090	13.28	4.911
Qmax(1) =	1.000 *	1.000 *	13.885) +
	0.906 *	1.000 *	3.380) +
	0.902 *	1.000 *	2.090) + = 18.833

Qmax(2) =  
 1.000 \* 0.859 \* 13.885) +  
 1.000 \* 1.000 \* 3.380) +  
 0.995 \* 1.000 \* 2.090) + = 17.381

Qmax(3) =  
 1.000 \* 0.852 \* 13.885) +  
 1.000 \* 0.992 \* 3.380) +  
 1.000 \* 1.000 \* 2.090) + = 17.272

Total of 3 main streams to confluence:

Flow rates before confluence point:

13.885 3.380 2.090

Maximum flow rates at confluence using above data:

18.833 17.381 17.272

Area of streams before confluence:

6.450 1.490 0.900

Results of confluence:

Total flow rate = 18.833(CFS)

Time of concentration = 15.592 min.

Effective stream area after confluence = 8.840(Ac.)

\*\*\*\*\*  
 Process from Point/Station 48.000 to Point/Station 49.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

Upstream point/station elevation = 363.000(Ft.)  
 Downstream point/station elevation = 362.500(Ft.)  
 Pipe length = 113.18(Ft.) Manning's N = 0.015  
 No. of pipes = 1 Required pipe flow = 18.833(CFS)  
 Given pipe size = 36.00(In.)  
 Calculated individual pipe flow = 18.833(CFS)  
 Normal flow depth in pipe = 17.79(In.)  
 Flow top width inside pipe = 36.00(In.)  
 Critical Depth = 16.68(In.)  
 Pipe flow velocity = 5.41(Ft/s)  
 Travel time through pipe = 0.35 min.  
 Time of concentration (TC) = 15.94 min.

\*\*\*\*\*  
 Process from Point/Station 48.000 to Point/Station 49.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 1  
 Stream flow area = 8.840(Ac.)  
 Runoff from this stream = 18.833(CFS)  
 Time of concentration = 15.94 min.  
 Rainfall intensity = 4.365(In/Hr)  
 Program is now starting with Main Stream No. 2

\*\*\*\*\*  
 Process from Point/Station 52.100 to Point/Station 52.200  
 \*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 0.000  
 Decimal fraction soil group D = 1.000  
 [MEDIUM DENSITY RESIDENTIAL ]  
 (4.3 DU/A or Less )  
 Impervious value, Ai = 0.300  
 Sub-Area C Value = 0.520  
 Initial subarea total flow distance = 620.180(Ft.)  
 Highest elevation = 372.000(Ft.)  
 Lowest elevation = 368.000(Ft.)  
 Elevation difference = 4.000(Ft.) Slope = 0.645 %  
 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 = 8.73 minutes  
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{1/3})]$   
 $TC = [1.8 * (1.1 - 0.5200) * (70.000^{.5})] / (1.000^{1/3})] = 8.73$   
 The initial area total distance of 620.18 (Ft.) entered leaves a  
 remaining distance of 550.18 (Ft.)  
 Using Figure 3-4, the travel time for this distance is 5.93 minutes  
 for a distance of 550.18 (Ft.) and a slope of 1.00 %  
 with an elevation difference of 5.50(Ft.) from the end of the top area  
 $Tt = [(11.9 * length(Mi)^3) / (elevation change(Ft.))]^{.385} * 60(min/hr)$   
 $= 5.926 Minutes$   
 $Tt = [(11.9 * 0.1042^3) / (5.50)]^{.385} = 5.93$   
 Total initial area Ti = 8.73 minutes from Figure 3-3 formula plus  
 5.93 minutes from the Figure 3-4 formula = 14.66 minutes  
 Rainfall intensity (I) = 4.607(In/Hr) for a 100.0 year storm  
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.520  
 Subarea runoff = 2.995(CFS)  
 Total initial stream area = 1.250(Ac.)

\*\*\*\*\*  
 Process from Point/Station 52.200 to Point/Station 49.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

Upstream point/station elevation = 363.000(Ft.)  
 Downstream point/station elevation = 362.500(Ft.)  
 Pipe length = 27.37(Ft.) Manning's N = 0.015  
 No. of pipes = 1 Required pipe flow = 2.995(CFS)  
 Given pipe size = 24.00(In.)  
 Calculated individual pipe flow = 2.995(CFS)  
 Normal flow depth in pipe = 5.45(In.)  
 Flow top width inside pipe = 20.11(In.)  
 Critical Depth = 7.24(In.)  
 Pipe flow velocity = 5.59(Ft/s)  
 Travel time through pipe = 0.08 min.  
 Time of concentration (TC) = 14.74 min.

\*\*\*\*\*  
 Process from Point/Station 52.200 to Point/Station 49.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:  
 In Main Stream number: 2  
 Stream flow area = 1.250(Ac.)  
 Runoff from this stream = 2.995(CFS)  
 Time of concentration = 14.74 min.  
 Rainfall intensity = 4.591(In/Hr)  
 Program is now starting with Main Stream No. 3

\*\*\*\*\*  
 Process from Point/Station 42.000 to Point/Station 49.000  
 \*\*\*\* USER DEFINED FLOW INFORMATION AT A POINT \*\*\*\*

Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.660  
 Decimal fraction soil group C = 0.020  
 Decimal fraction soil group D = 0.320  
 [MEDIUM DENSITY RESIDENTIAL ]  
 (4.3 DU/A or Less )  
 Impervious value, Ai = 0.300  
 Sub-Area C Value = 0.473  
 Rainfall intensity (I) = 6.175(In/Hr) for a 100.0 year storm  
 User specified values are as follows:  
 TC = 9.31 min. Rain intensity = 6.18(In/Hr)  
 Total area = 13.050(Ac.) Total runoff = 21.578(CFS)

\*\*\*\*\*  
 Process from Point/Station 42.000 to Point/Station 49.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:  
 In Main Stream number: 3  
 Stream flow area = 13.050(Ac.)  
 Runoff from this stream = 21.578(CFS)  
 Time of concentration = 9.31 min.  
 Rainfall intensity = 6.175(In/Hr)  
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	18.833	15.94	4.365
2	2.995	14.74	4.591
3	21.578	9.31	6.175

Qmax(1) =  
 1.000 \* 1.000 \* 18.833) +  
 0.951 \* 1.000 \* 2.995) +  
 0.707 \* 1.000 \* 21.578) + = 36.934  
 Qmax(2) =  
 1.000 \* 0.925 \* 18.833) +

1.000 \* 1.000 \* 2.995) +  
 0.743 \* 1.000 \* 21.578) + = 36.454  
 Qmax(3) =  
 1.000 \* 0.584 \* 18.833) +  
 1.000 \* 0.632 \* 2.995) +  
 1.000 \* 1.000 \* 21.578) + = 34.468

Total of 3 main streams to confluence:  
 Flow rates before confluence point:  
 18.833 2.995 21.578  
 Maximum flow rates at confluence using above data:  
 36.934 36.454 34.468  
 Area of streams before confluence:  
 8.840 1.250 13.050

Results of confluence:  
 Total flow rate = 36.934(CFS)  
 Time of concentration = 15.941 min.  
 Effective stream area after confluence = 23.140(Ac.)

\*\*\*\*\*  
 Process from Point/Station 49.000 to Point/Station 50.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

Upstream point/station elevation = 362.500(Ft.)  
 Downstream point/station elevation = 361.500(Ft.)  
 Pipe length = 86.45(Ft.) Manning's N = 0.015  
 No. of pipes = 1 Required pipe flow = 36.934(CFS)  
 Given pipe size = 36.00(In.)  
 Calculated individual pipe flow = 36.934(CFS)  
 Normal flow depth in pipe = 19.97(In.)  
 Flow top width inside pipe = 35.78(In.)  
 Critical Depth = 23.71(In.)  
 Pipe flow velocity = 9.17(Ft/s)  
 Travel time through pipe = 0.16 min.  
 Time of concentration (TC) = 16.10 min.

\*\*\*\*\*  
 Process from Point/Station 49.000 to Point/Station 50.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:  
 In Main Stream number: 1  
 Stream flow area = 23.140(Ac.)  
 Runoff from this stream = 36.934(CFS)  
 Time of concentration = 16.10 min.  
 Rainfall intensity = 4.338(In/Hr)  
 Program is now starting with Main Stream No. 2



\*\*\*\*\*  
 Process from Point/Station 61.100 to Point/Station 61.200  
 \*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 0.000  
 Decimal fraction soil group D = 1.000  
 [MEDIUM DENSITY RESIDENTIAL ]  
 (4.3 DU/A or Less )  
 Impervious value, Ai = 0.300  
 Sub-Area C Value = 0.520  
 Initial subarea total flow distance = 323.190(Ft.)  
 Highest elevation = 371.000(Ft.)  
 Lowest elevation = 367.000(Ft.)  
 Elevation difference = 4.000(Ft.) Slope = 1.238 %  
 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 = 8.73 minutes  
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})]$   
 $TC = [1.8 * (1.1 - 0.5200) * (70.000^{.5})] / (1.000^{(1/3)})] = 8.73$   
 The initial area total distance of 323.19 (Ft.) entered leaves a  
 remaining distance of 253.19 (Ft.)  
 Using Figure 3-4, the travel time for this distance is 3.26 minutes  
 for a distance of 253.19 (Ft.) and a slope of 1.00 %  
 with an elevation difference of 2.53(Ft.) from the end of the top area  
 $Tt = [11.9 * length(Mi)^3] / (elevation change(Ft.))^{.385} * 60 (min/hr)$   
 $= 3.260 \text{ Minutes}$   
 $Tt = [(11.9 * 0.0480^3) / (2.53)]^{.385} = 3.26$   
 Total initial area Ti = 8.73 minutes from Figure 3-3 formula plus  
 3.26 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 = 0.520  
 Subarea runoff = 2.073(CFS)  
 Total initial stream area = 0.760(Ac.)

\*\*\*\*\*  
 Process from Point/Station 61.200 to Point/Station 50.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

Upstream point/station elevation = 362.000(Ft.)  
 Downstream point/station elevation = 361.500(Ft.)  
 Pipe length = 11.16(Ft.) Manning's N = 0.015  
 No. of pipes = 1 Required pipe flow = 2.073(CFS)  
 Given pipe size = 24.00(In.)  
 Calculated individual pipe flow = 2.073(CFS)  
 Normal flow depth in pipe = 3.65(In.)  
 Flow top width inside pipe = 17.23(In.)  
 Critical Depth = 5.98(In.)  
 Pipe flow velocity = 6.88(Ft/s)  
 Travel time through pipe = 0.03 min.  
 Time of concentration (TC) = 12.02 min.

\*\*\*\*\*  
 Process from Point/Station 61.200 to Point/Station 50.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:  
 In Main Stream number: 2  
 Stream flow area = 0.760(Ac.)  
 Runoff from this stream = 2.073(CFS)  
 Time of concentration = 12.02 min.  
 Rainfall intensity = 5.237(In/Hr)  
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	36.934	16.10	4.338
2	2.073	12.02	5.237
Qmax(1) =			
	1.000 *	1.000 *	36.934) +
	0.828 *	1.000 *	2.073) + = 38.651
Qmax(2) =			
	1.000 *	0.747 *	36.934) +
	1.000 *	1.000 *	2.073) + = 29.655

Total of 2 main streams to confluence:  
 Flow rates before confluence point:  
 36.934 2.073  
 Maximum flow rates at confluence using above data:  
 38.651 29.655  
 Area of streams before confluence:  
 23.140 0.760

Results of confluence:  
 Total flow rate = 38.651(CFS)  
 Time of concentration = 16.098 min.  
 Effective stream area after confluence = 23.900(Ac.)

\*\*\*\*\*  
 Process from Point/Station 50.000 to Point/Station 52.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

Upstream point/station elevation = 361.500(Ft.)  
 Downstream point/station elevation = 359.500(Ft.)  
 Pipe length = 118.86(Ft.) Manning's N = 0.015  
 No. of pipes = 1 Required pipe flow = 38.651(CFS)  
 Given pipe size = 36.00(In.)  
 Calculated individual pipe flow = 38.651(CFS)  
 Normal flow depth in pipe = 18.33(In.)  
 Flow top width inside pipe = 35.99(In.)  
 Critical Depth = 24.27(In.)  
 Pipe flow velocity = 10.69(Ft/s)  
 Travel time through pipe = 0.19 min.  
 Time of concentration (TC) = 16.28 min.

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*****
Process from Point/Station      50.000 to Point/Station      52.000
**** CONFLUENCE OF MAIN STREAMS ****

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The following data inside Main Stream is listed:  
 In Main Stream number: 1  
 Stream flow area = 23.900(Ac.)  
 Runoff from this stream = 38.651(CFS)  
 Time of concentration = 16.28 min.  
 Rainfall intensity = 4.306(In/Hr)  
 Program is now starting with Main Stream No. 2

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*****
Process from Point/Station      62.100 to Point/Station      62.200
**** INITIAL AREA EVALUATION ****

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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  
 [MEDIUM DENSITY RESIDENTIAL ]  
 (4.3 DU/A or Less )  
 Impervious value, Ai = 0.300  
 Sub-Area C Value = 0.478  
 Initial subarea total flow distance = 454.750(Ft.)  
 Highest elevation = 372.000(Ft.)  
 Lowest elevation = 366.000(Ft.)  
 Elevation difference = 6.000(Ft.) Slope = 1.319 %  
 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 = 9.37 minutes  
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$   
 $TC = [1.8 * (1.1 - 0.4780) * (70.000^{.5})] / (1.000^{(1/3)}) = 9.37$   
 The initial area total distance of 454.75 (Ft.) entered leaves a  
 remaining distance of 384.75 (Ft.)  
 Using Figure 3-4, the travel time for this distance is 4.50 minutes  
 for a distance of 384.75 (Ft.) and a slope of 1.00 %  
 with an elevation difference of 3.85(Ft.) from the end of the top area  
 $Tt = [(11.9 * length(Mi)^3) / (elevation change(Ft.))]^{.385} * 60(min/hr)$   
 $= 4.500 Minutes$   
 $Tt = [(11.9 * 0.0729^3) / (3.85)]^{.385} = 4.50$   
 Total initial area Ti = 9.37 minutes from Figure 3-3 formula plus  
 4.50 minutes from the Figure 3-4 formula = 13.87 minutes  
 Rainfall intensity (I) = 4.776(In/Hr) for a 100.0 year storm  
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.478  
 Subarea runoff = 2.260(CFS)  
 Total initial stream area = 0.990(Ac.)

```

*****
Process from Point/Station      62.200 to Point/Station      51.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

```

Upstream point/station elevation = 361.000(Ft.)  
 Downstream point/station elevation = 360.500(Ft.)  
 Pipe length = 9.90(Ft.) Manning's N = 0.015  
 No. of pipes = 1 Required pipe flow = 2.260(CFS)  
 Given pipe size = 24.00(In.)  
 Calculated individual pipe flow = 2.260(CFS)  
 Normal flow depth in pipe = 3.69(In.)  
 Flow top width inside pipe = 17.32(In.)  
 Critical Depth = 6.26(In.)  
 Pipe flow velocity = 7.36(Ft/s)  
 Travel time through pipe = 0.02 min.  
 Time of concentration (TC) = 13.89 min.

```

*****
Process from Point/Station      62.200 to Point/Station      51.000
**** CONFLUENCE OF MINOR STREAMS ****

```

Along Main Stream number: 2 in normal stream number 1  
 Stream flow area = 0.990(Ac.)  
 Runoff from this stream = 2.260(CFS)  
 Time of concentration = 13.89 min.  
 Rainfall intensity = 4.771(In/Hr)

```

*****
Process from Point/Station      63.100 to Point/Station      63.200
**** 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  
 [MEDIUM DENSITY RESIDENTIAL ]  
 (4.3 DU/A or Less )  
 Impervious value, Ai = 0.300  
 Sub-Area C Value = 0.478  
 Initial subarea total flow distance = 455.230(Ft.)  
 Highest elevation = 370.000(Ft.)  
 Lowest elevation = 366.000(Ft.)  
 Elevation difference = 4.000(Ft.) Slope = 0.879 %  
 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 = 9.37 minutes  
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$   
 $TC = [1.8 * (1.1 - 0.4780) * (70.000^{.5})] / (1.000^{(1/3)}) = 9.37$   
 The initial area total distance of 455.23 (Ft.) entered leaves a  
 remaining distance of 385.23 (Ft.)

Using Figure 3-4, the travel time for this distance is 4.50 minutes for a distance of 385.23 (Ft.) and a slope of 1.00 % with an elevation difference of 3.85(Ft.) from the end of the top area  
 $Tt = [11.9 * \text{length}(Mi)^3 / (\text{elevation change}(Ft.))]^{.385} * 60 (\text{min}/\text{hr})$   
 = 4.504 Minutes  
 $Tt = [(11.9 * 0.0730^3) / (3.85)]^{.385} = 4.50$   
 Total initial area  $Ti = 9.37$  minutes from Figure 3-3 formula plus 4.50 minutes from the Figure 3-4 formula = 13.87 minutes  
 Rainfall intensity (I) = 4.775(In/Hr) for a 100.0 year storm  
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.478  
 Subarea runoff = 2.237(CFS)  
 Total initial stream area = 0.980 (Ac.)

\*\*\*\*\*  
 Process from Point/Station 63.200 to Point/Station 51.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

Upstream point/station elevation = 361.000(Ft.)  
 Downstream point/station elevation = 360.500(Ft.)  
 Pipe length = 25.71(Ft.) Manning's N = 0.015  
 No. of pipes = 1 Required pipe flow = 2.237(CFS)  
 Given pipe size = 24.00(In.)  
 Calculated individual pipe flow = 2.237(CFS)  
 Normal flow depth in pipe = 4.64(In.)  
 Flow top width inside pipe = 18.96(In.)  
 Critical Depth = 6.22(In.)  
 Pipe flow velocity = 5.25(Ft/s)  
 Travel time through pipe = 0.08 min.  
 Time of concentration (TC) = 13.95 min.

\*\*\*\*\*  
 Process from Point/Station 63.200 to Point/Station 51.000  
 \*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

Along Main Stream number: 2 in normal stream number 2  
 Stream flow area = 0.980(Ac.)  
 Runoff from this stream = 2.237(CFS)  
 Time of concentration = 13.95 min.  
 Rainfall intensity = 4.757(In/Hr)  
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	2.260	13.89	4.771
2	2.237	13.95	4.757
Qmax(1) =	1.000 *	1.000 *	2.260) +
	1.000 *	0.995 *	2.237) + = 4.487
Qmax(2) =	0.997 *	1.000 *	2.260) +
	1.000 *	1.000 *	2.237) + = 4.490

Total of 2 streams to confluence:  
 Flow rates before confluence point:  
 2.260 2.237  
 Maximum flow rates at confluence using above data:  
 4.487 4.490  
 Area of streams before confluence:  
 0.990 0.980  
 Results of confluence:  
 Total flow rate = 4.490(CFS)  
 Time of concentration = 13.953 min.  
 Effective stream area after confluence = 1.970 (Ac.)

\*\*\*\*\*  
 Process from Point/Station 51.000 to Point/Station 52.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

Upstream point/station elevation = 360.500(Ft.)  
 Downstream point/station elevation = 359.500(Ft.)  
 Pipe length = 111.10(Ft.) Manning's N = 0.015  
 No. of pipes = 1 Required pipe flow = 4.490(CFS)  
 Given pipe size = 24.00(In.)  
 Calculated individual pipe flow = 4.490(CFS)  
 Normal flow depth in pipe = 8.03(In.)  
 Flow top width inside pipe = 22.65(In.)  
 Critical Depth = 8.92(In.)  
 Pipe flow velocity = 4.87(Ft/s)  
 Travel time through pipe = 0.38 min.  
 Time of concentration (TC) = 14.33 min.

\*\*\*\*\*  
 Process from Point/Station 51.000 to Point/Station 52.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:  
 In Main Stream number: 2  
 Stream flow area = 1.970(Ac.)  
 Runoff from this stream = 4.490(CFS)  
 Time of concentration = 14.33 min.  
 Rainfall intensity = 4.675(In/Hr)  
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	38.651	16.28	4.306
2	4.490	14.33	4.675
Qmax(1) =	1.000 *	1.000 *	38.651) +
	0.921 *	1.000 *	4.490) + = 42.787
Qmax(2) =	1.000 *	0.880 *	38.651) +
	1.000 *	1.000 *	4.490) + = 38.511

Total of 2 main streams to confluence:

Flow rates before confluence point:

38.651 4.490

Maximum flow rates at confluence using above data:

42.787 38.511

Area of streams before confluence:

23.900 1.970

Results of confluence:

Total flow rate = 42.787(CFS)

Time of concentration = 16.284 min.

Effective stream area after confluence = 25.870 (Ac.)

\*\*\*\*\*  
Process from Point/Station 52.000 to Point/Station 53.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

Upstream point/station elevation = 359.500(Ft.)

Downstream point/station elevation = 358.500(Ft.)

Pipe length = 217.50(Ft.) Manning's N = 0.015

No. of pipes = 1 Required pipe flow = 42.787(CFS)

Given pipe size = 36.00(In.)

NOTE: Normal flow is pressure flow in user selected pipe size.

The approximate hydraulic grade line above the pipe invert is

0.476(Ft.) at the headworks or inlet of the pipe(s)

Pipe friction loss = 1.191(Ft.)

Minor friction loss = 0.284(Ft.) K-factor = 0.50

Pipe flow velocity = 6.05(Ft/s)

Travel time through pipe = 0.60 min.

Time of concentration (TC) = 16.88 min.

\*\*\*\*\*  
Process from Point/Station 52.000 to Point/Station 53.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 1

Stream flow area = 25.870 (Ac.)

Runoff from this stream = 42.787(CFS)

Time of concentration = 16.88 min.

Rainfall intensity = 4.207(In/Hr)

Program is now starting with Main Stream No. 2

\*\*\*\*\*  
Process from Point/Station 64.100 to Point/Station 64.200  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 0.000

Decimal fraction soil group D = 1.000

[MEDIUM DENSITY RESIDENTIAL

(4.3 DU/A or Less ) ]

Impervious value, Ai = 0.300

Sub-Area C Value = 0.520

Initial subarea total flow distance = 393.000(Ft.)

Highest elevation = 369.000(Ft.)

Lowest elevation = 363.000(Ft.)

Elevation difference = 6.000(Ft.) Slope = 1.527 %

Top of Initial Area Slope adjusted by User to 2.000 %

Bottom of Initial Area Slope adjusted by User to 1.000 %

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 = 7.41 minutes

TC =  $[1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5}] / (\% \text{ slope}^{(1/3)})]$

TC =  $[1.8 * (1.1 - 0.5200) * (80.000^{.5})] / (2.000^{(1/3)}) = 7.41$

The initial area total distance of 393.00 (Ft.) entered leaves a  
remaining distance of 313.00 (Ft.)

Using Figure 3-4, the travel time for this distance is 3.84 minutes

for a distance of 313.00 (Ft.) and a slope of 1.00 %

with an elevation difference of 3.13(Ft.) from the end of the top area

Tt =  $[11.9 * \text{length}(\text{Mi})^3] / (\text{elevation change}(\text{Ft.}))^{.385} * 60(\text{min/hr})$

= 3.839 Minutes

Tt =  $[(11.9 * 0.0593^3) / (3.13)]^{.385} = 3.84$

Total initial area Ti = 7.41 minutes from Figure 3-3 formula plus

3.84 minutes from the Figure 3-4 formula = 11.25 minutes

Rainfall intensity (I) = 5.466(In/Hr) for a 100.0 year storm

Effective runoff coefficient used for area (Q=KCIA) is C = 0.520

Subarea runoff = 2.075(CFS)

Total initial stream area = 0.730 (Ac.)

\*\*\*\*\*  
Process from Point/Station 64.200 to Point/Station 53.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

Upstream point/station elevation = 359.000(Ft.)

Downstream point/station elevation = 358.500(Ft.)

Pipe length = 9.25(Ft.) Manning's N = 0.015

No. of pipes = 1 Required pipe flow = 2.075(CFS)

Given pipe size = 24.00(In.)

Calculated individual pipe flow = 2.075(CFS)

Normal flow depth in pipe = 3.49(In.)

Flow top width inside pipe = 16.91(In.)

Critical Depth = 6.00(In.)

Pipe flow velocity = 7.35(Ft/s)

Travel time through pipe = 0.02 min.

Time of concentration (TC) = 11.27 min.

\*\*\*\*\*  
 Process from Point/Station 64.200 to Point/Station 53.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 2  
 Stream flow area = 0.730 (Ac.)  
 Runoff from this stream = 2.075 (CFS)  
 Time of concentration = 11.27 min.  
 Rainfall intensity = 5.459 (In/Hr)  
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	42.787	16.88	4.207
2	2.075	11.27	5.459
Qmax(1) =			
	1.000 *	1.000 *	42.787) +
	0.771 *	1.000 *	2.075) + = 44.385
Qmax(2) =			
	1.000 *	0.668 *	42.787) +
	1.000 *	1.000 *	2.075) + = 30.640

Total of 2 main streams to confluence:

Flow rates before confluence point:

42.787 2.075

Maximum flow rates at confluence using above data:

44.385 30.640

Area of streams before confluence:

25.870 0.730

Results of confluence:

Total flow rate = 44.385 (CFS)

Time of concentration = 16.882 min.

Effective stream area after confluence = 26.600 (Ac.)

\*\*\*\*\*  
 Process from Point/Station 53.000 to Point/Station 57.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

Upstream point/station elevation = 358.500 (Ft.)  
 Downstream point/station elevation = 358.000 (Ft.)  
 Pipe length = 77.87 (Ft.) Manning's N = 0.015  
 No. of pipes = 1 Required pipe flow = 44.385 (CFS)  
 Given pipe size = 36.00 (In.)  
 Calculated individual pipe flow = 44.385 (CFS)  
 Normal flow depth in pipe = 28.22 (In.)  
 Flow top width inside pipe = 29.64 (In.)  
 Critical Depth = 26.04 (In.)  
 Pipe flow velocity = 7.46 (Ft/s)  
 Travel time through pipe = 0.17 min.  
 Time of concentration (TC) = 17.06 min.  
 End of computations, total study area = 26.600 (Ac.)

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: 11/12/12

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

WARNER RANCH

100-YEAR STORM EVENT DEVELOPMENT CONDITIONS

BIO-RETENTION POND 5

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 65.100 to Point/Station 65.200  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 1.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000

[MEDIUM DENSITY RESIDENTIAL

(4.3 DU/A or Less )

Impervious value, Ai = 0.300

Sub-Area C Value = 0.450

Initial subarea total flow distance = 667.650(Ft.)

Highest elevation = 376.000(Ft.)

Lowest elevation = 368.000(Ft.)

Elevation difference = 8.000(Ft.) Slope = 1.198 %

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 = 9.79 minutes

TC =  $[1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5}] / (\% \text{ slope}^{(1/3)})]$

TC =  $[1.8 * (1.1 - 0.4500) * (70.000^{.5}) / (1.000^{(1/3)})] = 9.79$

The initial area total distance of 667.65 (Ft.) entered leaves a

remaining distance of 597.65 (Ft.)

Using Figure 3-4, the travel time for this distance is 6.32 minutes

for a distance of 597.65 (Ft.) and a slope of 1.00 %

with an elevation difference of 5.98(Ft.) from the end of the top area

Tt =  $[11.9 * \text{length}(\text{Mi})^3] / (\text{elevation change}(\text{Ft.}))^{.385} * 60(\text{min/hr})$   
= 6.316 Minutes  
Tt =  $[11.9 * 0.1132^3] / (5.98)^{.385} = 6.32$   
Total initial area Ti = 9.79 minutes from Figure 3-3 formula plus  
6.32 minutes from the Figure 3-4 formula = 16.11 minutes  
Rainfall intensity (I) = 4.337(In/Hr) for a 100.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450  
Subarea runoff = 4.371(CFS)  
Total initial stream area = 2.240(Ac.)

\*\*\*\*\*  
Process from Point/Station 65.200 to Point/Station 54.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

Upstream point/station elevation = 363.000(Ft.)  
Downstream point/station elevation = 362.500(Ft.)  
Pipe length = 36.84(Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 4.371(CFS)  
Given pipe size = 24.00(In.)  
Calculated individual pipe flow = 4.371(CFS)  
Normal flow depth in pipe = 7.11(In.)  
Flow top width inside pipe = 21.92(In.)  
Critical Depth = 8.81(In.)  
Pipe flow velocity = 5.61(Ft/s)  
Travel time through pipe = 0.11 min.  
Time of concentration (TC) = 16.21 min.

\*\*\*\*\*  
Process from Point/Station 65.200 to Point/Station 54.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 1

Stream flow area = 2.240(Ac.)

Runoff from this stream = 4.371(CFS)

Time of concentration = 16.21 min.

Rainfall intensity = 4.318(In/Hr)

Program is now starting with Main Stream No. 2

\*\*\*\*\*  
Process from Point/Station 66.100 to Point/Station 66.200  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 0.900  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.100

[MEDIUM DENSITY RESIDENTIAL

(4.3 DU/A or Less )

Impervious value, Ai = 0.300

Sub-Area C Value = 0.457

Initial subarea total flow distance = 667.510(Ft.)

Highest elevation = 380.000(Ft.)

Lowest elevation = 368.000(Ft.)

Elevation difference = 12.000(Ft.) Slope = 1.798 %

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 = 9.68 minutes  
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})]$   
 $TC = [1.8 * (1.1 - 0.4570) * (70.000^{.5})] / (1.000^{(1/3)}) = 9.68$   
 The initial area total distance of 667.51 (Ft.) entered leaves a  
 remaining distance of 597.51 (Ft.)  
 Using Figure 3-4, the travel time for this distance is 6.32 minutes  
 for a distance of 597.51 (Ft.) and a slope of 1.00 %  
 with an elevation difference of 5.98 (Ft.) from the end of the top area  
 $Tt = [11.9 * length(Mi)^3] / (elevation change(Ft.))^{.385} * 60 (min/hr)$   
 $= 6.315 \text{ Minutes}$   
 $Tt = [(11.9 * 0.1132^3) / (5.98)]^{.385} = 6.32$   
 Total initial area  $Ti = 9.68$  minutes from Figure 3-3 formula plus  
 6.32 minutes from the Figure 3-4 formula = 16.00 minutes  
 Rainfall intensity (I) = 4.355 (In/Hr) for a 100.0 year storm  
 Effective runoff coefficient used for area (Q=KCIA) is  $C = 0.457$   
 Subarea runoff = 2.667 (CFS)  
 Total initial stream area = 1.340 (Ac.)

\*\*\*\*\*  
 Process from Point/Station 66.200 to Point/Station 54.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

Upstream point/station elevation = 363.000 (Ft.)  
 Downstream point/station elevation = 362.500 (Ft.)  
 Pipe length = 11.40 (Ft.) Manning's N = 0.015  
 No. of pipes = 1 Required pipe flow = 2.667 (CFS)  
 Given pipe size = 24.00 (In.)  
 Calculated individual pipe flow = 2.667 (CFS)  
 Normal flow depth in pipe = 4.15 (In.)  
 Flow top width inside pipe = 18.14 (In.)  
 Critical Depth = 6.82 (In.)  
 Pipe flow velocity = 7.36 (Ft/s)  
 Travel time through pipe = 0.03 min.  
 Time of concentration (TC) = 16.02 min.

\*\*\*\*\*  
 Process from Point/Station 66.200 to Point/Station 54.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:  
 In Main Stream number: 2  
 Stream flow area = 1.340 (Ac.)  
 Runoff from this stream = 2.667 (CFS)  
 Time of concentration = 16.02 min.  
 Rainfall intensity = 4.351 (In/Hr)  
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	4.371	16.21	4.318
2	2.667	16.02	4.351
Qmax(1) =			
	1.000 *	1.000 *	4.371) +
	0.992 *	1.000 *	2.667) + =
Qmax(2) =			
	1.000 *	0.988 *	4.371) +
	1.000 *	1.000 *	2.667) + =

Total of 2 main streams to confluence:  
 Flow rates before confluence point:  
 4.371 2.667  
 Maximum flow rates at confluence using above data:  
 7.018 6.987  
 Area of streams before confluence:  
 2.240 1.340

Results of confluence:  
 Total flow rate = 7.018 (CFS)  
 Time of concentration = 16.215 min.  
 Effective stream area after confluence = 3.580 (Ac.)

\*\*\*\*\*  
 Process from Point/Station 54.000 to Point/Station 55.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

Upstream point/station elevation = 362.500 (Ft.)  
 Downstream point/station elevation = 362.000 (Ft.)  
 Pipe length = 189.00 (Ft.) Manning's N = 0.015  
 No. of pipes = 1 Required pipe flow = 7.018 (CFS)  
 Given pipe size = 24.00 (In.)  
 Calculated individual pipe flow = 7.018 (CFS)  
 Normal flow depth in pipe = 14.74 (In.)  
 Flow top width inside pipe = 23.36 (In.)  
 Critical Depth = 11.27 (In.)  
 Pipe flow velocity = 3.47 (Ft/s)  
 Travel time through pipe = 0.91 min.  
 Time of concentration (TC) = 17.12 min.

\*\*\*\*\*  
 Process from Point/Station 54.000 to Point/Station 55.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:  
 In Main Stream number: 1  
 Stream flow area = 3.580 (Ac.)  
 Runoff from this stream = 7.018 (CFS)  
 Time of concentration = 17.12 min.  
 Rainfall intensity = 4.169 (In/Hr)  
 Program is now starting with Main Stream No. 2



\*\*\*\*\*  
 Process from Point/Station 67.100 to Point/Station 67.200  
 \*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 1.000  
 Decimal fraction soil group C = 0.000  
 Decimal fraction soil group D = 0.000  
 [MEDIUM DENSITY RESIDENTIAL ]  
 (4.3 DU/A or Less )  
 Impervious value, Ai = 0.300  
 Sub-Area C Value = 0.450  
 Initial subarea total flow distance = 269.000(Ft.)  
 Highest elevation = 370.000(Ft.)  
 Lowest elevation = 367.000(Ft.)  
 Elevation difference = 3.000(Ft.) Slope = 1.115 %  
 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 = 9.79 minutes  
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})]$   
 $TC = [1.8 * (1.1 - 0.4500) * (70.000^{.5}) / (1.000^{(1/3)})] = 9.79$   
 The initial area total distance of 269.00 (Ft.) entered leaves a  
 remaining distance of 199.00 (Ft.)  
 Using Figure 3-4, the travel time for this distance is 2.71 minutes  
 for a distance of 199.00 (Ft.) and a slope of 1.00 %  
 with an elevation difference of 1.99(Ft.) from the end of the top area  
 $Tt = [11.9 * length(Mi)^3] / (elevation change(Ft.))^{.385} * 60(min/hr)$   
 $= 2.708 \text{ Minutes}$   
 $Tt = [(11.9 * 0.0377^3) / (1.99)]^{.385} = 2.71$   
 Total initial area Ti = 9.79 minutes from Figure 3-3 formula plus  
 2.71 minutes from the Figure 3-4 formula = 12.50 minutes  
 Rainfall intensity (I) = 5.107(In/Hr) for a 100.0 year storm  
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.450  
 Subarea runoff = 0.667(CFS)  
 Total initial stream area = 0.290(Ac.)

\*\*\*\*\*  
 Process from Point/Station 67.100 to Point/Station 67.200  
 \*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

Along Main Stream number: 2 in normal stream number 1  
 Stream flow area = 0.290(Ac.)  
 Runoff from this stream = 0.667(CFS)  
 Time of concentration = 12.50 min.  
 Rainfall intensity = 5.107(In/Hr)

\*\*\*\*\*  
 Process from Point/Station 70.100 to Point/Station 67.200  
 \*\*\*\* 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  
 [MEDIUM DENSITY RESIDENTIAL ]  
 (4.3 DU/A or Less )  
 Impervious value, Ai = 0.300  
 Sub-Area C Value = 0.410  
 Initial subarea total flow distance = 337.660(Ft.)  
 Highest elevation = 370.000(Ft.)  
 Lowest elevation = 367.000(Ft.)  
 Elevation difference = 3.000(Ft.) Slope = 0.888 %  
 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 = 10.39 minutes  
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})]$   
 $TC = [1.8 * (1.1 - 0.4100) * (70.000^{.5}) / (1.000^{(1/3)})] = 10.39$   
 The initial area total distance of 337.66 (Ft.) entered leaves a  
 remaining distance of 267.66 (Ft.)  
 Using Figure 3-4, the travel time for this distance is 3.40 minutes  
 for a distance of 267.66 (Ft.) and a slope of 1.00 %  
 with an elevation difference of 2.68(Ft.) from the end of the top area  
 $Tt = [11.9 * length(Mi)^3] / (elevation change(Ft.))^{.385} * 60(min/hr)$   
 $= 3.403 \text{ Minutes}$   
 $Tt = [(11.9 * 0.0507^3) / (2.68)]^{.385} = 3.40$   
 Total initial area Ti = 10.39 minutes from Figure 3-3 formula plus  
 3.40 minutes from the Figure 3-4 formula = 13.79 minutes  
 Rainfall intensity (I) = 4.792(In/Hr) for a 100.0 year storm  
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.410  
 Subarea runoff = 1.297(CFS)  
 Total initial stream area = 0.660(Ac.)

\*\*\*\*\*  
 Process from Point/Station 70.100 to Point/Station 67.200  
 \*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*

Along Main Stream number: 2 in normal stream number 2  
 Stream flow area = 0.660(Ac.)  
 Runoff from this stream = 1.297(CFS)  
 Time of concentration = 13.79 min.  
 Rainfall intensity = 4.792(In/Hr)  
 Summary of stream data:

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

1	0.667	12.50	5.107
2	1.297	13.79	4.792

Qmax(1) =  
 1.000 \* 1.000 \* 0.667) +  
 1.000 \* 0.906 \* 1.297) + = 1.841  
 Qmax(2) =  
 0.938 \* 1.000 \* 0.667) +  
 1.000 \* 1.000 \* 1.297) + = 1.922

Total of 2 streams to confluence:  
 Flow rates before confluence point:  
 0.667 1.297

Maximum flow rates at confluence using above data:  
 1.841 1.922

Area of streams before confluence:  
 0.290 0.660

Results of confluence:  
 Total flow rate = 1.922(CFS)  
 Time of concentration = 13.794 min.  
 Effective stream area after confluence = 0.950(Ac.)

\*\*\*\*\*  
 Process from Point/Station 67.200 to Point/Station 55.000  
 \*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*

Upstream point/station elevation = 362.500(Ft.)  
 Downstream point/station elevation = 362.000(Ft.)  
 Pipe length = 8.52(Ft.) Manning's N = 0.015  
 No. of pipes = 1 Required pipe flow = 1.922(CFS)  
 Given pipe size = 24.00(In.)  
 Calculated individual pipe flow = 1.922(CFS)  
 Normal flow depth in pipe = 3.30(In.)  
 Flow top width inside pipe = 16.52(In.)  
 Critical Depth = 5.76(In.)  
 Pipe flow velocity = 7.40(Ft/s)  
 Travel time through pipe = 0.02 min.  
 Time of concentration (TC) = 13.81 min.

\*\*\*\*\*  
 Process from Point/Station 67.200 to Point/Station 55.000  
 \*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*

The following data inside Main Stream is listed:  
 In Main Stream number: 2  
 Stream flow area = 0.950(Ac.)  
 Runoff from this stream = 1.922(CFS)  
 Time of concentration = 13.81 min.  
 Rainfall intensity = 4.788(In/Hr)  
 Program is now starting with Main Stream No. 3

\*\*\*\*\*  
 Process from Point/Station 68.100 to Point/Station 68.200  
 \*\*\* INITIAL AREA EVALUATION \*\*\*

Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 1.000  
 Decimal fraction soil group C = 0.000  
 Decimal fraction soil group D = 0.000  
 [MEDIUM DENSITY RESIDENTIAL ]  
 (4.3 DU/A or Less )  
 Impervious value, Ai = 0.300  
 Sub-Area C Value = 0.450  
 Initial subarea total flow distance = 539.260(Ft.)  
 Highest elevation = 372.000(Ft.)  
 Lowest elevation = 367.000(Ft.)  
 Elevation difference = 5.000(Ft.) Slope = 0.927 %  
 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 = 9.79 minutes  
 $TC = [1.8 * (1.1 - C) * distance^{.5}] / (\% slope^{1/3})$   
 $TC = [1.8 * (1.1 - 0.4500) * (70.000^{.5})] / (1.000^{1/3}) = 9.79$   
 The initial area total distance of 539.26 (Ft.) entered leaves a  
 remaining distance of 469.26 (Ft.)  
 Using Figure 3-4, the travel time for this distance is 5.24 minutes  
 for a distance of 469.26 (Ft.) and a slope of 1.00 %  
 with an elevation difference of 4.69(Ft.) from the end of the top area  
 $Tt = [(11.9 * length^{.3}) / (elevation\ change^{.385})] * 60\ (min/hr)$   
 $= 5.243\ Minutes$   
 $Tt = [(11.9 * 0.0889^{.3}) / (4.69)^{.385}] = 5.24$   
 Total initial area Ti = 9.79 minutes from Figure 3-3 formula plus  
 5.24 minutes from the Figure 3-4 formula = 15.03 minutes  
 Rainfall intensity (I) = 4.534(In/Hr) for a 100.0 year storm  
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.450  
 Subarea runoff = 3.530(CFS)  
 Total initial stream area = 1.730(Ac.)

\*\*\*\*\*  
 Process from Point/Station 68.100 to Point/Station 68.200  
 \*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

Along Main Stream number: 3 in normal stream number 1  
 Stream flow area = 1.730(Ac.)  
 Runoff from this stream = 3.530(CFS)  
 Time of concentration = 15.03 min.  
 Rainfall intensity = 4.534(In/Hr)

\*\*\*\*\*  
 Process from Point/Station 69.100 to Point/Station 68.200  
 \*\*\*\* 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 = 314.000(Ft.)  
 Highest elevation = 370.000(Ft.)  
 Lowest elevation = 367.000(Ft.)  
 Elevation difference = 3.000(Ft.) Slope = 0.955 %  
 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 314.00 (Ft.) entered leaves a  
 remaining distance of 244.00 (Ft.)  
 Using Figure 3-4, the travel time for this distance is 3.17 minutes  
 for a distance of 244.00 (Ft.) and a slope of 1.00 %  
 with an elevation difference of 2.44(Ft.) from the end of the top area  
 $Tt = [11.9 * length(Mi)^3] / (elevation change(Ft.))^{.385} * 60(min/hr)$   
 $= 3.169 Minutes$   
 $Tt = [(11.9 * 0.0462^3) / (2.44)]^{.385} = 3.17$   
 Total initial area Ti = 10.03 minutes from Figure 3-3 formula plus  
 3.17 minutes from the Figure 3-4 formula = 13.20 minutes  
 Rainfall intensity (I) = 4.931(In/Hr) for a 100.0 year storm  
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.434  
 Subarea runoff = 0.942(CFS)  
 Total initial stream area = 0.440(Ac.)

\*\*\*\*\*  
 Process from Point/Station 69.100 to Point/Station 68.200  
 \*\*\*\* CONFLUENCE OF MINOR STREAMS \*\*\*\*

Along Main Stream number: 3 in normal stream number 2  
 Stream flow area = 0.440(Ac.)  
 Runoff from this stream = 0.942(CFS)  
 Time of concentration = 13.20 min.  
 Rainfall intensity = 4.931(In/Hr)  
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	3.530	15.03	4.534
2	0.942	13.20	4.931
Qmax(1) =			
	1.000 *	1.000 *	3.530) +
	0.920 *	1.000 *	0.942) + = 4.395
Qmax(2) =			
	1.000 *	0.878 *	3.530) +
	1.000 *	1.000 *	0.942) + = 4.041

Total of 2 streams to confluence:  
 Flow rates before confluence point:  
 3.530 0.942  
 Maximum flow rates at confluence using above data:  
 4.395 4.041  
 Area of streams before confluence:  
 1.730 0.440  
 Results of confluence:  
 Total flow rate = 4.395(CFS)  
 Time of concentration = 15.032 min.  
 Effective stream area after confluence = 2.170(Ac.)

\*\*\*\*\*  
 Process from Point/Station 68.200 to Point/Station 55.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

Upstream point/station elevation = 362.500(Ft.)  
 Downstream point/station elevation = 362.000(Ft.)  
 Pipe length = 27.07(Ft.) Manning's N = 0.015  
 No. of pipes = 1 Required pipe flow = 4.395(CFS)  
 Given pipe size = 24.00(In.)  
 Calculated individual pipe flow = 4.395(CFS)  
 Normal flow depth in pipe = 6.59(In.)  
 Flow top width inside pipe = 21.42(In.)  
 Critical Depth = 8.83(In.)  
 Pipe flow velocity = 6.27(Ft/s)  
 Travel time through pipe = 0.07 min.  
 Time of concentration (TC) = 15.10 min.

\*\*\*\*\*  
 Process from Point/Station 68.200 to Point/Station 55.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 3  
 Stream flow area = 2.170 (Ac.)  
 Runoff from this stream = 4.395 (CFS)  
 Time of concentration = 15.10 min.  
 Rainfall intensity = 4.520 (In/Hr)  
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	7.018	17.12	4.169
2	1.922	13.81	4.788
3	4.395	15.10	4.520

Qmax(1) =  
 1.000 \* 1.000 \* 7.018) +  
 0.871 \* 1.000 \* 1.922) +  
 0.922 \* 1.000 \* 4.395) + = 12.745

Qmax(2) =  
 1.000 \* 0.807 \* 7.018) +  
 1.000 \* 1.000 \* 1.922) +  
 1.000 \* 0.915 \* 4.395) + = 11.604

Qmax(3) =  
 1.000 \* 0.882 \* 7.018) +  
 0.944 \* 1.000 \* 1.922) +  
 1.000 \* 1.000 \* 4.395) + = 12.401

Total of 3 main streams to confluence:

Flow rates before confluence point:

7.018 1.922 4.395

Maximum flow rates at confluence using above data:

12.745 11.604 12.401

Area of streams before confluence:

3.580 0.950 2.170

Results of confluence:

Total flow rate = 12.745 (CFS)

Time of concentration = 17.123 min.

Effective stream area after confluence = 6.700 (Ac.)

\*\*\*\*\*  
 Process from Point/Station 55.000 to Point/Station 56.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

Upstream point/station elevation = 362.000 (Ft.)  
 Downstream point/station elevation = 358.500 (Ft.)  
 Pipe length = 727.30 (Ft.) Manning's N = 0.015  
 No. of pipes = 1 Required pipe flow = 12.745 (CFS)  
 Given pipe size = 24.00 (In.)  
 Calculated individual pipe flow = 12.745 (CFS)

Normal flow depth in pipe = 18.45 (In.)  
 Flow top width inside pipe = 20.24 (In.)  
 Critical Depth = 15.39 (In.)  
 Pipe flow velocity = 4.92 (Ft/s)  
 Travel time through pipe = 2.46 min.  
 Time of concentration (TC) = 19.59 min.

\*\*\*\*\*  
 Process from Point/Station 55.000 to Point/Station 56.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 1  
 Stream flow area = 6.700 (Ac.)  
 Runoff from this stream = 12.745 (CFS)  
 Time of concentration = 19.59 min.  
 Rainfall intensity = 3.822 (In/Hr)  
 Program is now starting with Main Stream No. 2

\*\*\*\*\*  
 Process from Point/Station 71.100 to Point/Station 71.200  
 \*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Decimal fraction soil group A = 0.200  
 Decimal fraction soil group B = 0.700  
 Decimal fraction soil group C = 0.000  
 Decimal fraction soil group D = 0.100  
 [MEDIUM DENSITY RESIDENTIAL ]  
 (4.3 DU/A or Less )  
 Impervious value, Ai = 0.300  
 Sub-Area C Value = 0.449  
 Initial subarea total flow distance = 534.000 (Ft.)  
 Highest elevation = 370.000 (Ft.)  
 Lowest elevation = 364.000 (Ft.)  
 Elevation difference = 6.000 (Ft.) Slope = 1.124 %  
 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 = 9.80 minutes

TC =  $[1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5}] / (\% \text{ slope}^{(1/3)})]$

TC =  $[1.8 * (1.1 - 0.4490) * (70.000^{.5}) / (1.000^{(1/3)})] = 9.80$

The initial area total distance of 534.00 (Ft.) entered leaves a remaining distance of 464.00 (Ft.)

Using Figure 3-4, the travel time for this distance is 5.20 minutes

for a distance of 464.00 (Ft.) and a slope of 1.00 %  
 with an elevation difference of 4.64 (Ft.) from the end of the top area  
 $Tt = [11.9 * \text{length}(\text{Mi})^{.3}] / (\text{elevation change}(\text{Ft.}))^{.385} * 60 (\text{min/hr})$   
 = 5.198 Minutes

$Tt = [(11.9 * 0.0879^{.3}) / (4.64)]^{.385} = 5.20$

Total initial area Ti = 9.80 minutes from Figure 3-3 formula plus  
 5.20 minutes from the Figure 3-4 formula = 15.00 minutes

Rainfall intensity (I) = 4.540(In/Hr) for a 100.0 year storm  
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.449  
 Subarea runoff = 2.324(CFS)  
 Total initial stream area = 1.140(Ac.)

\*\*\*\*\*  
 Process from Point/Station 71.200 to Point/Station 56.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

Upstream point/station elevation = 359.000(Ft.)  
 Downstream point/station elevation = 358.500(Ft.)  
 Pipe length = 9.63(Ft.) Manning's N = 0.015  
 No. of pipes = 1 Required pipe flow = 2.324(CFS)  
 Given pipe size = 24.00(In.)  
 Calculated individual pipe flow = 2.324(CFS)  
 Normal flow depth in pipe = 3.72(In.)  
 Flow top width inside pipe = 17.37(In.)  
 Critical Depth = 6.36(In.)  
 Pipe flow velocity = 7.50(Ft/s)  
 Travel time through pipe = 0.02 min.  
 Time of concentration (TC) = 15.02 min.

\*\*\*\*\*  
 Process from Point/Station 71.200 to Point/Station 56.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:  
 In Main Stream number: 2  
 Stream flow area = 1.140(Ac.)  
 Runoff from this stream = 2.324(CFS)  
 Time of concentration = 15.02 min.  
 Rainfall intensity = 4.536(In/Hr)  
 Program is now starting with Main Stream No. 3

\*\*\*\*\*  
 Process from Point/Station 72.100 to Point/Station 72.200  
 \*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Decimal fraction soil group A = 0.100  
 Decimal fraction soil group B = 0.800  
 Decimal fraction soil group C = 0.000  
 Decimal fraction soil group D = 0.100  
 [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 = 524.630(Ft.)  
 Highest elevation = 370.000(Ft.)  
 Lowest elevation = 365.500(Ft.)  
 Elevation difference = 4.500(Ft.) Slope = 0.858 %  
 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 = 9.74 minutes  
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})]$   
 $TC = [1.8 * (1.1 - 0.4530) * (70.000^{.5})] / (1.000^{(1/3)}) = 9.74$   
 The initial area total distance of 524.63 (Ft.) entered leaves a  
 remaining distance of 454.63 (Ft.)  
 Using Figure 3-4, the travel time for this distance is 5.12 minutes  
 for a distance of 454.63 (Ft.) and a slope of 1.00 %  
 with an elevation difference of 4.55(Ft.) from the end of the top area  
 $Tt = [11.9 * length(Mi)^3] / (elevation change(Ft.))^{.385} * 60(min/hr)$   
 $= 5.117 Minutes$   
 $Tt = [(11.9 * 0.0861^3) / (4.55)]^{.385} = 5.12$   
 Total initial area Ti = 9.74 minutes from Figure 3-3 formula plus  
 5.12 minutes from the Figure 3-4 formula = 14.86 minutes  
 Rainfall intensity (I) = 4.568(In/Hr) for a 100.0 year storm  
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.453  
 Subarea runoff = 2.421(CFS)  
 Total initial stream area = 1.170(Ac.)

\*\*\*\*\*  
 Process from Point/Station 72.200 to Point/Station 56.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

Upstream point/station elevation = 360.500(Ft.)  
 Downstream point/station elevation = 358.500(Ft.)  
 Pipe length = 38.18(Ft.) Manning's N = 0.015  
 No. of pipes = 1 Required pipe flow = 2.421(CFS)  
 Given pipe size = 24.00(In.)  
 Calculated individual pipe flow = 2.421(CFS)  
 Normal flow depth in pipe = 3.79(In.)  
 Flow top width inside pipe = 17.49(In.)  
 Critical Depth = 6.49(In.)  
 Pipe flow velocity = 7.61(Ft/s)  
 Travel time through pipe = 0.08 min.  
 Time of concentration (TC) = 14.94 min.

\*\*\*\*\*  
 Process from Point/Station 72.200 to Point/Station 56.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:  
 In Main Stream number: 3  
 Stream flow area = 1.170 (Ac.)  
 Runoff from this stream = 2.421 (CFS)  
 Time of concentration = 14.94 min.  
 Rainfall intensity = 4.551 (In/Hr)  
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	12.745	19.59	3.822
2	2.324	15.02	4.536
3	2.421	14.94	4.551

Qmax(1) =  
 1.000 \* 1.000 \* 12.745) +  
 0.843 \* 1.000 \* 2.324) +  
 0.840 \* 1.000 \* 2.421) + = 16.737

Qmax(2) =  
 1.000 \* 0.767 \* 12.745) +  
 1.000 \* 1.000 \* 2.324) +  
 0.997 \* 1.000 \* 2.421) + = 14.512

Qmax(3) =  
 1.000 \* 0.763 \* 12.745) +  
 1.000 \* 0.995 \* 2.324) +  
 1.000 \* 1.000 \* 2.421) + = 14.457

Total of 3 main streams to confluence:  
 Flow rates before confluence point:  
 12.745 2.324 2.421  
 Maximum flow rates at confluence using above data:  
 16.737 14.512 14.457  
 Area of streams before confluence:  
 6.700 1.140 1.170

Results of confluence:  
 Total flow rate = 16.737 (CFS)  
 Time of concentration = 19.586 min.  
 Effective stream area after confluence = 9.010 (Ac.)

\*\*\*\*\*  
 Process from Point/Station 56.000 to Point/Station 57.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

Upstream point/station elevation = 358.500 (Ft.)  
 Downstream point/station elevation = 358.000 (Ft.)  
 Pipe length = 145.83 (Ft.) Manning's N = 0.015  
 No. of pipes = 1 Required pipe flow = 16.737 (CFS)  
 Given pipe size = 36.00 (In.)  
 Calculated individual pipe flow = 16.737 (CFS)  
 Normal flow depth in pipe = 17.88 (In.)  
 Flow top width inside pipe = 36.00 (In.)  
 Critical Depth = 15.67 (In.)  
 Pipe flow velocity = 4.78 (Ft/s)  
 Travel time through pipe = 0.51 min.  
 Time of concentration (TC) = 20.09 min.

\*\*\*\*\*  
 Process from Point/Station 56.000 to Point/Station 57.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:  
 In Main Stream number: 1  
 Stream flow area = 9.010 (Ac.)  
 Runoff from this stream = 16.737 (CFS)  
 Time of concentration = 20.09 min.  
 Rainfall intensity = 3.760 (In/Hr)  
 Program is now starting with Main Stream No. 2

\*\*\*\*\*  
 Process from Point/Station 53.000 to Point/Station 57.000  
 \*\*\*\* USER DEFINED FLOW INFORMATION AT A POINT \*\*\*\*

Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.670  
 Decimal fraction soil group C = 0.000  
 Decimal fraction soil group D = 0.330  
 [MEDIUM DENSITY RESIDENTIAL ]  
 (4.3 DU/A or Less )  
 Impervious value, Ai = 0.300  
 Sub-Area C Value = 0.473  
 Rainfall intensity (I) = 4.178 (In/Hr) for a 100.0 year storm  
 User specified values are as follows:  
 TC = 17.06 min. Rain intensity = 4.18 (In/Hr)  
 Total area = 26.600 (Ac.) Total runoff = 44.385 (CFS)

\*\*\*\*\*  
 Process from Point/Station 53.000 to Point/Station 57.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 2  
 Stream flow area = 26.600(Ac.)  
 Runoff from this stream = 44.385(CFS)  
 Time of concentration = 17.06 min.  
 Rainfall intensity = 4.178(In/Hr)  
 Summary of stream data:

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

1	16.737	20.09	3.760
2	44.385	17.06	4.178

Qmax(1) =

1.000 *	1.000 *	16.737) +	
0.900 *	1.000 *	44.385) + =	56.674

Qmax(2) =

1.000 *	0.849 *	16.737) +	
1.000 *	1.000 *	44.385) + =	58.594

Total of 2 main streams to confluence:

Flow rates before confluence point:

16.737	44.385
--------	--------

Maximum flow rates at confluence using above data:

56.674	58.594
--------	--------

Area of streams before confluence:

9.010	26.600
-------	--------

Results of confluence:

Total flow rate = 58.594(CFS)

Time of concentration = 17.060 min.

Effective stream area after confluence = 35.610(Ac.)

\*\*\*\*\*  
 Process from Point/Station 57.000 to Point/Station 58.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

Upstream point/station elevation = 358.000(Ft.)  
 Downstream point/station elevation = 356.000(Ft.)  
 Pipe length = 138.81(Ft.) Manning's N = 0.015  
 No. of pipes = 1 Required pipe flow = 58.594(CFS)  
 Given pipe size = 36.00(In.)  
 Calculated individual pipe flow = 58.594(CFS)  
 Normal flow depth in pipe = 25.36(In.)  
 Flow top width inside pipe = 32.85(In.)  
 Critical Depth = 29.73(In.)  
 Pipe flow velocity = 11.01(Ft/s)  
 Travel time through pipe = 0.21 min.  
 Time of concentration (TC) = 17.27 min.

\*\*\*\*\*  
 Process from Point/Station 57.000 to Point/Station 58.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 1  
 Stream flow area = 35.610(Ac.)  
 Runoff from this stream = 58.594(CFS)  
 Time of concentration = 17.27 min.  
 Rainfall intensity = 4.146(In/Hr)  
 Program is now starting with Main Stream No. 2

\*\*\*\*\*  
 Process from Point/Station 73.100 to Point/Station 73.200  
 \*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 0.000

Decimal fraction soil group D = 1.000

[MEDIUM DENSITY RESIDENTIAL ]

(4.3 DU/A or Less )

Impervious value, Ai = 0.300

Sub-Area C Value = 0.520

Initial subarea total flow distance = 397.310(Ft.)

Highest elevation = 366.000(Ft.)

Lowest elevation = 361.000(Ft.)

Elevation difference = 5.000(Ft.) Slope = 1.258 %

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 = 8.73 minutes

TC =  $[1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5}] / (\% \text{ slope}^{(1/3)})]$

TC =  $[1.8 * (1.1 - 0.5200) * (70.000^{.5})] / (1.000^{(1/3)}) = 8.73$

The initial area total distance of 397.31 (Ft.) entered leaves a

remaining distance of 327.31 (Ft.)

Using Figure 3-4, the travel time for this distance is 3.97 minutes

for a distance of 327.31 (Ft.) and a slope of 1.00 %

with an elevation difference of 3.27(Ft.) from the end of the top area

Tt =  $[(11.9 * \text{length}(\text{Mi})^3) / (\text{elevation change}(\text{Ft.}))]^{.385} * 60(\text{min/hr})$

= 3.973 Minutes

Tt =  $[(11.9 * 0.0620^3) / (3.27)]^{.385} = 3.97$

Total initial area Ti = 8.73 minutes from Figure 3-3 formula plus

3.97 minutes from the Figure 3-4 formula = 12.71 minutes

Rainfall intensity (I) = 5.053(In/Hr) for a 100.0 year storm

Effective runoff coefficient used for area (Q=KCIA) is C = 0.520

Subarea runoff = 2.470(CFS)

Total initial stream area = 0.940(Ac.)



\*\*\*\*\*  
 Process from Point/Station 73.200 to Point/Station 58.000  
 \*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

Upstream point/station elevation = 356.500(Ft.)  
 Downstream point/station elevation = 356.000(Ft.)  
 Pipe length = 9.88(Ft.) Manning's N = 0.015  
 No. of pipes = 1 Required pipe flow = 2.470(CFS)  
 Given pipe size = 24.00(In.)  
 Calculated individual pipe flow = 2.470(CFS)  
 Normal flow depth in pipe = 3.86(In.)  
 Flow top width inside pipe = 17.63(In.)  
 Critical Depth = 6.56(In.)  
 Pipe flow velocity = 7.57(Ft/s)  
 Travel time through pipe = 0.02 min.  
 Time of concentration (TC) = 12.73 min.

\*\*\*\*\*  
 Process from Point/Station 73.200 to Point/Station 58.000  
 \*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:  
 In Main Stream number: 2  
 Stream flow area = 0.940(Ac.)  
 Runoff from this stream = 2.470(CFS)  
 Time of concentration = 12.73 min.  
 Rainfall intensity = 5.047(In/Hr)  
 Program is now starting with Main Stream No. 3

\*\*\*\*\*  
 Process from Point/Station 74.100 to Point/Station 74.200  
 \*\*\* INITIAL AREA EVALUATION \*\*\*\*

Decimal fraction soil group A = 0.000  
 Decimal fraction soil group B = 0.000  
 Decimal fraction soil group C = 0.000  
 Decimal fraction soil group D = 1.000  
 [MEDIUM DENSITY RESIDENTIAL ]  
 (4.3 DU/A or Less )  
 Impervious value, Ai = 0.300  
 Sub-Area C Value = 0.520  
 Initial subarea total flow distance = 706.460(Ft.)  
 Highest elevation = 368.000(Ft.)  
 Lowest elevation = 361.000(Ft.)  
 Elevation difference = 7.000(Ft.) Slope = 0.991 %  
 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 = 8.73 minutes  
 $TC = [1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5}] / (\% \text{ slope}^{(1/3)})$   
 $TC = [1.8 * (1.1 - 0.5200) * (70.000^{.5})] / (1.000^{(1/3)}) = 8.73$   
 The initial area total distance of 706.46 (Ft.) entered leaves a  
 remaining distance of 636.46 (Ft.)

Using Figure 3-4, the travel time for this distance is 6.63 minutes  
 for a distance of 636.46 (Ft.) and a slope of 1.00 %  
 with an elevation difference of 6.36(Ft.) from the end of the top area  
 $Tt = [11.9 * \text{length}(\text{Mi})^3] / (\text{elevation change}(\text{Ft.}))^{.385} * 60(\text{min/hr})$   
 = 6.630 Minutes  
 $Tt = [(11.9 * 0.1205^3) / (6.36)]^{.385} = 6.63$   
 Total initial area Ti = 8.73 minutes from Figure 3-3 formula plus  
 6.63 minutes from the Figure 3-4 formula = 15.36 minutes  
 Rainfall intensity (I) = 4.470(In/Hr) for a 100.0 year storm  
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.520  
 Subarea runoff = 1.139(CFS)  
 Total initial stream area = 0.490(Ac.)

\*\*\*\*\*  
 Process from Point/Station 74.200 to Point/Station 58.000  
 \*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

Upstream point/station elevation = 356.500(Ft.)  
 Downstream point/station elevation = 356.000(Ft.)  
 Pipe length = 28.00(Ft.) Manning's N = 0.015  
 No. of pipes = 1 Required pipe flow = 1.139(CFS)  
 Given pipe size = 24.00(In.)  
 Calculated individual pipe flow = 1.139(CFS)  
 Normal flow depth in pipe = 3.41(In.)  
 Flow top width inside pipe = 16.76(In.)  
 Critical Depth = 4.41(In.)  
 Pipe flow velocity = 4.17(Ft/s)  
 Travel time through pipe = 0.11 min.  
 Time of concentration (TC) = 15.48 min.

\*\*\*\*\*  
 Process from Point/Station 74.200 to Point/Station 58.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 3  
 Stream flow area = 0.490 (Ac.)  
 Runoff from this stream = 1.139 (CFS)  
 Time of concentration = 15.48 min.  
 Rainfall intensity = 4.449 (In/Hr)  
 Summary of stream data:

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

1	58.594	17.27	4.146
2	2.470	12.73	5.047
3	1.139	15.48	4.449

Qmax(1) =  
 1.000 \* 1.000 \* 58.594) +  
 0.821 \* 1.000 \* 2.470) +  
 0.932 \* 1.000 \* 1.139) + = 61.684

Qmax(2) =  
 1.000 \* 0.737 \* 58.594) +  
 1.000 \* 1.000 \* 2.470) +  
 1.000 \* 0.823 \* 1.139) + = 46.595

Qmax(3) =  
 1.000 \* 0.896 \* 58.594) +  
 0.882 \* 1.000 \* 2.470) +  
 1.000 \* 1.000 \* 1.139) + = 55.825

Total of 3 main streams to confluence:

Flow rates before confluence point:

58.594 2.470 1.139

Maximum flow rates at confluence using above data:

61.684 46.595 55.825

Area of streams before confluence:

35.610 0.940 0.490

Results of confluence:

Total flow rate = 61.684 (CFS)

Time of concentration = 17.270 min.

Effective stream area after confluence = 37.040 (Ac.)

\*\*\*\*\*  
 Process from Point/Station 58.000 to Point/Station 59.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

Upstream point/station elevation = 356.000 (Ft.)  
 Downstream point/station elevation = 355.000 (Ft.)  
 Pipe length = 36.84 (Ft.) Manning's N = 0.015  
 No. of pipes = 1 Required pipe flow = 61.684 (CFS)  
 Given pipe size = 36.00 (In.)  
 Calculated individual pipe flow = 61.684 (CFS)  
 Normal flow depth in pipe = 21.09 (In.)  
 Flow top width inside pipe = 35.46 (In.)  
 Critical Depth = 30.37 (In.)  
 Pipe flow velocity = 14.33 (Ft/s)  
 Travel time through pipe = 0.04 min.  
 Time of concentration (TC) = 17.31 min.  
 End of computations, total study area = 37.040 (Ac.)

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: 11/12/12

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

WARNER RANCH

100-YEAR STORM EVENT DEVELOPMENT CONDITIONS  
BIO-RETENTION POND 5

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 75.100 to Point/Station 75.200  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Decimal fraction soil group A = 0.400  
Decimal fraction soil group B = 0.100  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.500

[MEDIUM DENSITY RESIDENTIAL ]

(4.3 DU/A or Less )

Impervious value, Ai = 0.300

Sub-Area C Value = 0.469

Initial subarea total flow distance = 334.000(Ft.)

Highest elevation = 362.000(Ft.)

Lowest elevation = 359.000(Ft.)

Elevation difference = 3.000(Ft.) Slope = 0.898 %

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 = 9.50 minutes

$TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})]$

$TC = [1.8 * (1.1 - 0.4690) * (70.000^{.5})] / (1.000^{(1/3)}) = 9.50$

The initial area total distance of 334.00 (Ft.) entered leaves a

remaining distance of 264.00 (Ft.)

Using Figure 3-4, the travel time for this distance is 3.37 minutes

for a distance of 264.00 (Ft.) and a slope of 1.00 %

with an elevation difference of 2.64(Ft.) from the end of the top area

$Tt = [11.9 * length(Mi)^3] / (elevation\ change(Ft.))^{.385} * 60(min/hr)$   
= 3.367 Minutes

$Tt = [(11.9 * 0.0500^3) / (2.64)]^{.385} = 3.37$

Total initial area Ti = 9.50 minutes from Figure 3-3 formula plus  
3.37 minutes from the Figure 3-4 formula = 12.87 minutes

Rainfall intensity (I) = 5.012(In/Hr) for a 100.0 year storm

Effective runoff coefficient used for area (Q=KCIA) is C = 0.469

Subarea runoff = 1.716(CFS)

Total initial stream area = 0.730(Ac.)

\*\*\*\*\*  
Process from Point/Station 75.200 to Point/Station 60.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

Upstream point/station elevation = 356.000(Ft.)

Downstream point/station elevation = 355.500(Ft.)

Pipe length = 25.15(Ft.) Manning's N = 0.015

No. of pipes = 1 Required pipe flow = 1.716(CFS)

Given pipe size = 24.00(In.)

Calculated individual pipe flow = 1.716(CFS)

Normal flow depth in pipe = 4.05(In.)

Flow top width inside pipe = 17.99(In.)

Critical Depth = 5.44(In.)

Pipe flow velocity = 4.89(Ft/s)

Travel time through pipe = 0.09 min.

Time of concentration (TC) = 12.96 min.

\*\*\*\*\*  
Process from Point/Station 75.200 to Point/Station 60.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 1

Stream flow area = 0.730(Ac.)

Runoff from this stream = 1.716(CFS)

Time of concentration = 12.96 min.

Rainfall intensity = 4.990(In/Hr)

Program is now starting with Main Stream No. 2

```

*****
Process from Point/Station 76.100 to Point/Station 76.200
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.200
Decimal fraction soil group B = 0.300
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 = 339.340(Ft.)
Highest elevation = 361.000(Ft.)
Lowest elevation = 359.000(Ft.)
Elevation difference = 2.000(Ft.) Slope = 0.589 %
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.)^0.5]/(% slope^(1/3))
TC = [1.8*(1.1-0.8700)*( 60.000^0.5)]/( 1.000^(1/3))= 3.21
The initial area total distance of 339.34 (Ft.) entered leaves a
remaining distance of 279.34 (Ft.)
Using Figure 3-4, the travel time for this distance is 3.52 minutes
for a distance of 279.34 (Ft.) and a slope of 1.00 %
with an elevation difference of 2.79(Ft.) from the end of the top area
Tt = [(11.9*length(Mi)^3)/(elevation change(Ft.))]^0.385 *60(min/hr)
= 3.517 Minutes
Tt=[(11.9*0.0529^3)/( 2.79)]^0.385= 3.52
Total initial area Ti = 3.21 minutes from Figure 3-3 formula plus
3.52 minutes from the Figure 3-4 formula = 6.72 minutes
Rainfall intensity (I) = 7.618(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff = 1.326(CFS)
Total initial stream area = 0.200(Ac.)

*****
Process from Point/Station 76.200 to Point/Station 60.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 360.000(Ft.)
Downstream point/station elevation = 355.500(Ft.)
Pipe length = 24.00(Ft.) Manning's N = 0.015
No. of pipes = 1 Required pipe flow = 1.326(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 1.326(CFS)
Normal flow depth in pipe = 2.09(In.)
Flow top width inside pipe = 13.54(In.)
Critical Depth = 4.76(In.)
Pipe flow velocity = 9.93(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 6.76 min.

```

```

*****
Process from Point/Station 76.200 to Point/Station 60.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area = 0.200(Ac.)
Runoff from this stream = 1.326(CFS)
Time of concentration = 6.76 min.
Rainfall intensity = 7.589(In/Hr)
Summary of stream data:

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

1 1.716 12.96 4.990
2 1.326 6.76 7.589
Qmax(1) =
1.000 * 1.000 * 1.716) +
0.658 * 1.000 * 1.326) + = 2.587
Qmax(2) =
1.000 * 0.522 * 1.716) +
1.000 * 1.000 * 1.326) + = 2.221

Total of 2 main streams to confluence:
Flow rates before confluence point:
1.716 1.326
Maximum flow rates at confluence using above data:
2.587 2.221
Area of streams before confluence:
0.730 0.200

Results of confluence:
Total flow rate = 2.587(CFS)
Time of concentration = 12.955 min.
Effective stream area after confluence = 0.930(Ac.)

*****
Process from Point/Station 60.000 to Point/Station 61.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 355.500(Ft.)
Downstream point/station elevation = 355.000(Ft.)
Pipe length = 36.78(Ft.) Manning's N = 0.015
No. of pipes = 1 Required pipe flow = 2.587(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 2.587(CFS)
Normal flow depth in pipe = 5.45(In.)
Flow top width inside pipe = 20.11(In.)
Critical Depth = 6.71(In.)
Pipe flow velocity = 4.82(Ft/s)
Travel time through pipe = 0.13 min.
Time of concentration (TC) = 13.08 min.
End of computations, total study area = 0.930 (Ac.)

```

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: 11/12/12

-----  
\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*  
WARNER RANCH (FIRE STATION)  
100-YEAR STORM EVENT DEVELOPMENT CONDITIONS  
BIO-RETENTION POND 5  
-----  
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 77.100 to Point/Station 77.200  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

Decimal fraction soil group A = 0.700  
Decimal fraction soil group B = 0.300  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
[COMMERCIAL area type ]  
(Neighborhood Commercial )  
Impervious value, Ai = 0.800  
Sub-Area C Value = 0.763  
Initial subarea total flow distance = 207.750(Ft.)  
Highest elevation = 368.000(Ft.)  
Lowest elevation = 365.000(Ft.)  
Elevation difference = 3.000(Ft.) Slope = 1.444 %  
Top of Initial Area Slope adjusted by User to 2.000 %  
Bottom of Initial Area Slope adjusted by User to 2.000 %  
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:  
The maximum overland flow distance is 75.00 (Ft)  
for the top area slope value of 2.00 %, in a development type of  
Neighborhood Commercial  
In Accordance With Figure 3-3  
Initial Area Time of Concentration = 4.17 minutes  
TC =  $[1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5}] / (\% \text{ slope}^{(1/3)})]$   
TC =  $[1.8 * (1.1 - 0.7630) * (75.000^{.5})] / (2.000^{(1/3)})] = 4.17$   
The initial area total distance of 207.75 (Ft.) entered leaves a  
remaining distance of 132.75 (Ft.)  
Using Figure 3-4, the travel time for this distance is 1.52 minutes  
for a distance of 132.75 (Ft.) and a slope of 2.00 %  
with an elevation difference of 2.66(Ft.) from the end of the top area

$T_t = [11.9 * \text{length}(\text{Mi})^3] / (\text{elevation change}(\text{Ft.}))^{.385} * 60(\text{min/hr})$   
= 1.519 Minutes  
 $T_t = [(11.9 * 0.0251^3) / (2.66)]^{.385} = 1.52$   
Total initial area Ti = 4.17 minutes from Figure 3-3 formula plus  
1.52 minutes from the Figure 3-4 formula = 5.69 minutes  
Rainfall intensity (I) = 8.486(In/Hr) for a 100.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.763  
Subarea runoff = 2.914(CFS)  
Total initial stream area = 0.450(Ac.)

\*\*\*\*\*  
Process from Point/Station 77.200 to Point/Station 62.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

---

Upstream point/station elevation = 362.000(Ft.)  
Downstream point/station elevation = 361.500(Ft.)  
Pipe length = 246.00(Ft.) Manning's N = 0.015  
No. of pipes = 1 Required pipe flow = 2.914(CFS)  
Given pipe size = 18.00(In.)  
Calculated individual pipe flow = 2.914(CFS)  
Normal flow depth in pipe = 11.20(In.)  
Flow top width inside pipe = 17.45(In.)  
Critical Depth = 7.78(In.)  
Pipe flow velocity = 2.52(Ft/s)  
Travel time through pipe = 1.63 min.  
Time of concentration (TC) = 7.31 min.

\*\*\*\*\*  
Process from Point/Station 77.200 to Point/Station 62.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:  
In Main Stream number: 1  
Stream flow area = 0.450(Ac.)  
Runoff from this stream = 2.914(CFS)  
Time of concentration = 7.31 min.  
Rainfall intensity = 7.215(In/Hr)  
Program is now starting with Main Stream No. 2

\*\*\*\*\*  
Process from Point/Station 78.100 to Point/Station 78.200  
\*\*\*\* 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  
[COMMERCIAL area type ]  
(Neighborhood Commercial )  
Impervious value, Ai = 0.800  
Sub-Area C Value = 0.760  
Initial subarea total flow distance = 154.200(Ft.)  
Highest elevation = 366.000(Ft.)  
Lowest elevation = 364.000(Ft.)

Elevation difference = 2.000(Ft.) Slope = 1.297 %  
 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  
 Neighborhood Commercial  
 In Accordance With Figure 3-3  
 Initial Area Time of Concentration = 4.74 minutes  
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})]$   
 $TC = [1.8 * (1.1 - 0.7600) * (60.000^{.5})] / (1.000^{(1/3)}) = 4.74$   
 The initial area total distance of 154.20 (Ft.) entered leaves a  
 remaining distance of 94.20 (Ft.)  
 Using Figure 3-4, the travel time for this distance is 1.52 minutes  
 for a distance of 94.20 (Ft.) and a slope of 1.00 %  
 with an elevation difference of 0.94(Ft.) from the end of the top area  
 $Tt = [11.9 * length(Mi)^3 / (elevation change(Ft.))]^{.385} * 60(min/hr)$   
 = 1.523 Minutes  
 $Tt = [(11.9 * 0.0178^3) / (0.94)]^{.385} = 1.52$   
 Total initial area  $Ti = 4.74$  minutes from Figure 3-3 formula plus  
 1.52 minutes from the Figure 3-4 formula = 6.26 minutes  
 Rainfall intensity (I) = 7.975(In/Hr) for a 100.0 year storm  
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.760  
 Subarea runoff = 1.758(CFS)  
 Total initial stream area = 0.290(Ac.)

\*\*\*\*\*  
 Process from Point/Station 78.200 to Point/Station 62.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

Upstream point/station elevation = 362.000(Ft.)  
 Downstream point/station elevation = 361.500(Ft.)  
 Pipe length = 15.06(Ft.) Manning's N = 0.015  
 No. of pipes = 1 Required pipe flow = 1.758(CFS)  
 Given pipe size = 12.00(In.)  
 Calculated individual pipe flow = 1.758(CFS)  
 Normal flow depth in pipe = 4.61(In.)  
 Flow top width inside pipe = 11.67(In.)  
 Critical Depth = 6.77(In.)  
 Pipe flow velocity = 6.33(Ft/s)  
 Travel time through pipe = 0.04 min.  
 Time of concentration (TC) = 6.30 min.

\*\*\*\*\*  
 Process from Point/Station 78.200 to Point/Station 62.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:  
 In Main Stream number: 2  
 Stream flow area = 0.290(Ac.)  
 Runoff from this stream = 1.758(CFS)  
 Time of concentration = 6.30 min.  
 Rainfall intensity = 7.942(In/Hr)

# Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	2.914	7.31	7.215
2	1.758	6.30	7.942
Qmax(1) =	1.000 *	1.000 *	2.914) +
	0.908 *	1.000 *	1.758) + =
Qmax(2) =	1.000 *	0.862 *	2.914) +
	1.000 *	1.000 *	1.758) + =

Total of 2 main streams to confluence:  
 Flow rates before confluence point:  
 2.914 1.758  
 Maximum flow rates at confluence using above data:  
 4.510 4.268  
 Area of streams before confluence:  
 0.450 0.290

Results of confluence:  
 Total flow rate = 4.510(CFS)  
 Time of concentration = 7.315 min.  
 Effective stream area after confluence = 0.740(Ac.)

\*\*\*\*\*  
 Process from Point/Station 62.000 to Point/Station 63.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (User specified size) \*\*\*\*

Upstream point/station elevation = 361.500(Ft.)  
 Downstream point/station elevation = 361.000(Ft.)  
 Pipe length = 49.01(Ft.) Manning's N = 0.015  
 No. of pipes = 1 Required pipe flow = 4.510(CFS)  
 Given pipe size = 18.00(In.)  
 Calculated individual pipe flow = 4.510(CFS)  
 Normal flow depth in pipe = 8.89(In.)  
 Flow top width inside pipe = 18.00(In.)  
 Critical Depth = 9.77(In.)  
 Pipe flow velocity = 5.18(Ft/s)  
 Travel time through pipe = 0.16 min.  
 Time of concentration (TC) = 7.47 min.  
 End of computations, total study area = 0.740 (Ac.)

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: 11/12/12

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

WARNER RANCH

100-YEAR STORM EVENT DEVELOPMENT CONDITIONS

BIO-RETENTION POND 5

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 79.200 to Point/Station 64.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

Decimal fraction soil group A = 0.700

Decimal fraction soil group B = 0.200

Decimal fraction soil group C = 0.000

Decimal fraction soil group D = 0.100

[UNDISTURBED NATURAL TERRAIN ]

(Permanent Open Space )

Impervious value, Ai = 0.000

Sub-Area C Value = 0.225

Initial subarea total flow distance = 715.730(Ft.)

Highest elevation = 368.000(Ft.)

Lowest elevation = 355.000(Ft.)

Elevation difference = 13.000(Ft.) Slope = 1.816 %

Top of Initial Area Slope adjusted by User to 3.000 %

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 3.00 %, in a development type of  
Permanent Open Space

In Accordance With Figure 3-3

Initial Area Time of Concentration = 10.92 minutes

TC =  $[1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5}] / (\% \text{ slope}^{(1/3)})]$

TC =  $[1.8 * (1.1 - 0.225) * (100.000^{.5}) / (3.000^{(1/3)})] = 10.92$

The initial area total distance of 715.73 (Ft.) entered leaves a  
remaining distance of 615.73 (Ft.)

Using Figure 3-4, the travel time for this distance is 10.27 minutes

for a distance of 615.73 (Ft.) and a slope of 0.30 %

with an elevation difference of 1.85(Ft.) from the end of the top area

Tt =  $[11.9 * \text{length}(\text{Mi})^3 / (\text{elevation change}(\text{Ft.}))^{.385}] * 60(\text{min/hr})$

= 10.274 Minutes

Tt =  $[(11.9 * 0.1166^3) / (1.85)]^{.385} = 10.27$

Total initial area Ti = 10.92 minutes from Figure 3-3 formula plus  
10.27 minutes from the Figure 3-4 formula = 21.19 minutes

Rainfall intensity (I) = 3.633(In/Hr) for a 100.0 year storm

Effective runoff coefficient used for area (Q=KCIA) is C = 0.225

Subarea runoff = 1.741(CFS)

Total initial stream area = 2.130(Ac.)

\*\*\*\*\*  
Process from Point/Station 79.200 to Point/Station 64.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 1

Stream flow area = 2.130(Ac.)

Runoff from this stream = 1.741(CFS)

Time of concentration = 21.19 min.

Rainfall intensity = 3.633(In/Hr)

Program is now starting with Main Stream No. 2

\*\*\*\*\*  
Process from Point/Station 63.000 to Point/Station 64.000  
\*\*\*\* USER DEFINED FLOW INFORMATION AT A POINT \*\*\*\*

Decimal fraction soil group A = 0.850

Decimal fraction soil group B = 0.150

Decimal fraction soil group C = 0.000

Decimal fraction soil group D = 0.000

[COMMERCIAL area type ]

(Neighborhood Commercial )

Impervious value, Ai = 0.800

Sub-Area C Value = 0.762

Rainfall intensity (I) = 7.118(In/Hr) for a 100.0 year storm

User specified values are as follows:

TC = 7.47 min. Rain intensity = 7.12(In/Hr)

Total area = 0.740(Ac.) Total runoff = 4.510(CFS)

\*\*\*\*\*  
Process from Point/Station 63.000 to Point/Station 64.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

The following data inside Main Stream is listed:

In Main Stream number: 2

Stream flow area = 0.740(Ac.)

Runoff from this stream = 4.510(CFS)

Time of concentration = 7.47 min.

Rainfall intensity = 7.118(In/Hr)

Program is now starting with Main Stream No. 3



```

*****
Process from Point/Station      61.000 to Point/Station      64.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

```

```

Decimal fraction soil group A = 0.400
Decimal fraction soil group B = 0.270
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.330
[MEDIUM DENSITY RESIDENTIAL      ]
(4.3 DU/A or Less      )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.457
Rainfall intensity (I) =      4.959(In/Hr) for a 100.0 year storm
User specified values are as follows:
TC = 13.08 min. Rain intensity =      4.96(In/Hr)
Total area =      0.930(Ac.) Total runoff =      2.587(CFS)

```

```

*****
Process from Point/Station      61.000 to Point/Station      64.000
**** CONFLUENCE OF MAIN STREAMS ****

```

```

The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      0.930(Ac.)
Runoff from this stream =      2.587(CFS)
Time of concentration = 13.08 min.
Rainfall intensity =      4.959(In/Hr)
Program is now starting with Main Stream No. 4

```

```

*****
Process from Point/Station      59.000 to Point/Station      64.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

```

```

Decimal fraction soil group A = 0.160
Decimal fraction soil group B = 0.610
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.230
[MEDIUM DENSITY RESIDENTIAL      ]
(4.3 DU/A or Less      )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.460
Rainfall intensity (I) =      4.139(In/Hr) for a 100.0 year storm
User specified values are as follows:
TC = 17.31 min. Rain intensity =      4.14(In/Hr)
Total area =      37.040(Ac.) Total runoff =      61.684(CFS)

```

```

*****
Process from Point/Station      59.000 to Point/Station      64.000
**** CONFLUENCE OF MAIN STREAMS ****

```

```

The following data inside Main Stream is listed:
In Main Stream number: 4
Stream flow area =      37.040(Ac.)
Runoff from this stream =      61.684(CFS)
Time of concentration = 17.31 min.
Rainfall intensity =      4.139(In/Hr)
Summary of stream data:

```

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	1.741	21.19	3.633
2	4.510	7.47	7.118
3	2.587	13.08	4.959
4	61.684	17.31	4.139
Qmax(1) =			
	1.000 *	1.000 *	1.741) +
	0.510 *	1.000 *	4.510) +
	0.732 *	1.000 *	2.587) +
	0.878 *	1.000 *	61.684) + =
Qmax(2) =			
	1.000 *	0.352 *	1.741) +
	1.000 *	1.000 *	4.510) +
	1.000 *	0.571 *	2.587) +
	1.000 *	0.432 *	61.684) + =
Qmax(3) =			
	1.000 *	0.617 *	1.741) +
	0.697 *	1.000 *	4.510) +
	1.000 *	1.000 *	2.587) +
	1.000 *	0.756 *	61.684) + =
Qmax(4) =			
	1.000 *	0.817 *	1.741) +
	0.582 *	1.000 *	4.510) +
	0.835 *	1.000 *	2.587) +
	1.000 *	1.000 *	61.684) + =

```

Total of 4 main streams to confluence:
Flow rates before confluence point:
1.741      4.510      2.587      61.684
Maximum flow rates at confluence using above data:
60.071      33.220      53.414      67.888
Area of streams before confluence:
2.130      0.740      0.930      37.040

```

```

Results of confluence:
Total flow rate =      67.888(CFS)
Time of concentration = 17.310 min.
Effective stream area after confluence =      40.840(Ac.)

```

\*\*\*\*\*  
Process from Point/Station        64.000 to Point/Station        64.000  
\*\*\*\* 6 HOUR HYDROGRAPH \*\*\*\*

\*\*\*\*\*  
Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003

Time of Concentration = 17.31  
Basin Area = 40.84 Acres  
6 Hour Rainfall = 3.500 Inches  
Runoff Coefficient = 0.453  
Peak Discharge = 67.89 CFS

Time (Min)	Discharge (CFS)
0	0.000
17	3.920
34	4.048
51	4.341
68	4.509
85	4.901
102	5.132
119	5.692
136	6.037
153	6.920
170	7.503
187	9.170
204	10.445
221	15.337
238	21.609
255	67.888
272	12.301
289	8.230
306	6.440
323	5.394
340	4.695
357	4.188
374	3.801