APPENDIX H1

Drainage Study

TENTATIVE MAP DRAINAGE STUDY
For
OTAY RANCH PORTION OF VILLAGE 4

City of Chula Vista, California

Prepared for:
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A Delaware Limited Liability
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August 3, 2016

Hunsaker & Associates
San Diego, Inc.

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Principal

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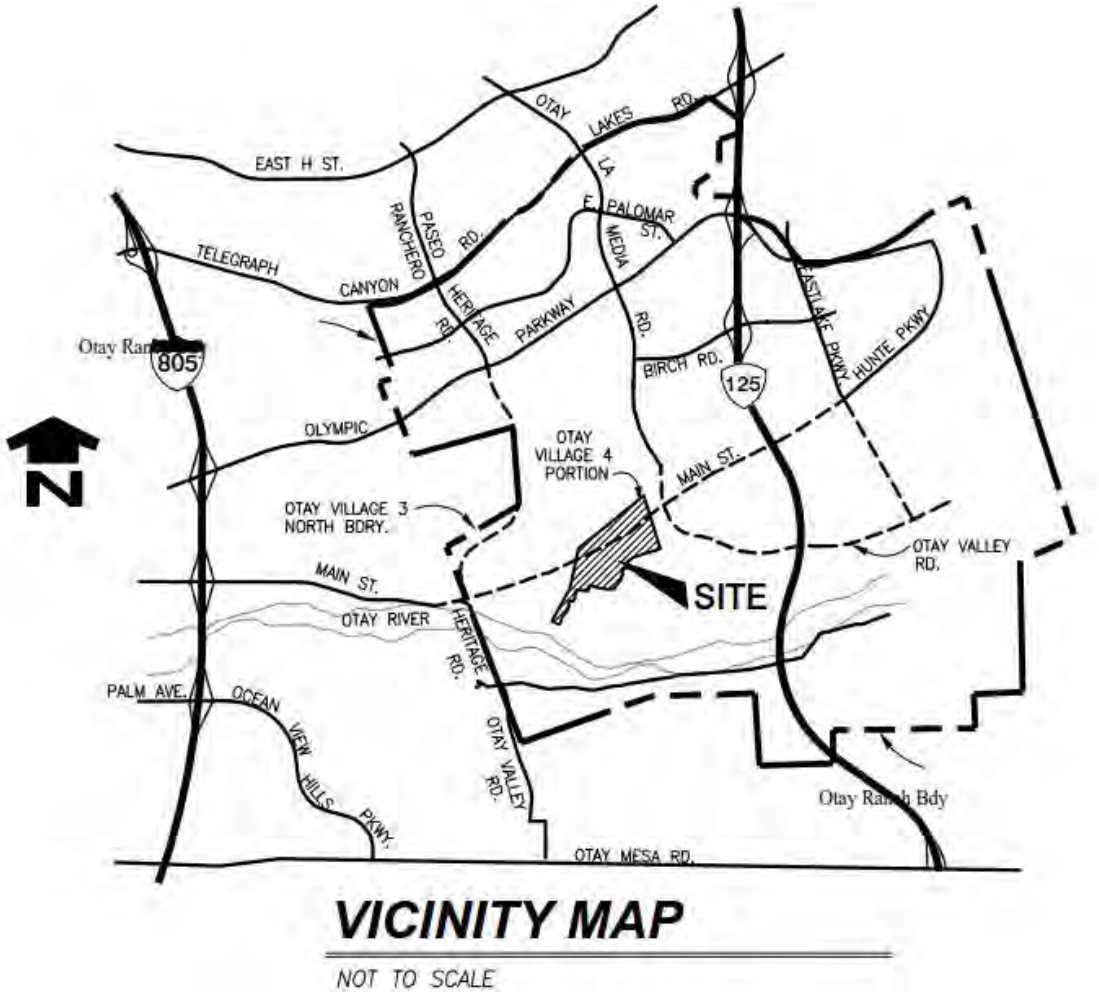
CHAPTER 1 - EXECUTIVE SUMMARY

1.1 Introduction

This drainage study has been prepared to assess the pre-developed and post-developed condition peak runoff rates from the proposed Otay Ranch Village 4 development for Otay Valley Quarry, LLC.

The project site is located north of the Otay River, south of Wolf Canyon, west of Village 8 West, and east of the future Village 3 within the City of Chula Vista, California. See Vicinity Map below. The project will include the western extension of Main Street between Village 8 West and the future Main Street bridge crossing over Wolf Canyon. The development will predominately consist of single and multi- family residential dwelling units with associated streets and utility infrastructure.



VICINITY MAP

NOT TO SCALE

The gross project area is approximately 166 acres including all residential areas as well as Open Space/ Preserve and circulation areas. Due to the imperviousness increase associated with the development, it is anticipated that peak flows generated from the site will increase runoff downstream unless measures are made to mitigate the peak flows. These

increases will need to be considered in the projects design and addressed in this study. In addition, the proposed basin will also serve as a water quality and flow control (hydromodification) treatment facility for the developed portions of the site. All impervious areas constructed throughout the site will need to route their 85th percentile runoff through the 'water quality' basin. The proposed basin location is south of Main Street at the western edge of the development.

In Existing condition, the Village 4 South site generally flows in a northwesterly direction towards a tributary of Wolf Canyon at which time runoff will then travel west then south towards the Otay River. Development of the site will cut portions of land located at the higher elevations. Runoff will be collected within the proposed storm drain system which will eventually outlet into Wolf Canyon. Per the Flood Insurance Rate Map No. 06073C2178, the site lies outside the FEMA floodplain boundary. Therefore, a Letter of Map Revision is not required. See Exhibit 3 for an overlay of the site on Flood Insurance Rate Map which also includes the Savage Dam inundation flood line.

The MSCP Open Space Preserve is located along the site northern and western boundaries. With exceptions relative to sewer line and storm drain routing, the development of Otay Ranch Village 4 South, as proposed in the TM, will not encroach into the MSCP area and will have an assigned easement through the preserve. Since this project is located adjacent to a Preserve area, it will adhere to Section 7.5.2 of the City's *MSCP Subarea Adjacency Guidelines* pertaining to drainage and water quality.

Per the City of Chula Vista drainage criteria, the Modified Rational Method should be used to determine peak design flow rates when the contributing drainage area is less than 1.0-square mile. Since the total watershed area discharging from the Otay Ranch Village 3 site is less than 1.0-square mile, the AES-2010 computer software was used to model the runoff response per the Modified Rational Method.

Methodology used for the computation of design rainfall events, runoff coefficients, and rainfall intensity values are consistent with criteria set forth in the most current "San Diego County Hydrology Manual" and the "City of Chula Vista Subdivision Manual". A detailed explanation of methodology and model development used for this analysis is listed in Chapter 2 of this report.

1.2 Summary of Pre-Developed Conditions

The topography for existing Village 4 South site is such that its runoff drains in a northwesterly direction towards a tributary of Wolf Canyon and subsequently to Wolf Canyon and the Otay River. The watershed which drains through the site has an elevation high point of about 650 ft. MSL. Several finger canyons subdivide the drainage areas but not in any significant hydrologic manner. Refer to Exhibit 1, Existing Hydrology Map in Chapter 4 for watershed boundary associated with the project area. The watershed area delineated on the map was determined as a means of equally comparing the impact of the proposed development with its comparable existing condition at a point immediately downstream of the proposed site at Wolf Canyon.

Table 1 below summarizes the 50 and 100-year pre-development peak flows from the site in existing condition. A runoff coefficient of 0.60 was used for the existing tributary areas per the City of Chula Vista Subdivision Manual. These coefficients correspond to vegetated steep slopes.

TABLE 1 - Summary of Pre-Developed Flows to the Wolf Canyon

Discharge Location	Drainage Area (ac)	50-Year Peak Flow (cfs)	100-Year Peak Flow (cfs)
Wolf Canyon	201.4	266.21	295.29

Supporting calculations for the data presented in Table 1 are located in Chapter 3 of this report. The corresponding hydrology map is Exhibit 1 in Chapter 5.

1.3 Summary of Developed Conditions

The Otay Ranch Village 3 Tentative Map will consist of single and multi-family residential dwelling units, roads for circulation, and open space areas. The extension of Main Street west from the Village 8 West project boundary is also included with this development as well as offsite sewer lines and stormwater facilities. The proposed 'water quality/HMP' basin will be located on the south side of Main Street and west of the developed portions of Village 4 South.

The extension of Main Street will be approximately 3,700 linear feet from the eastern boundary of the site where it connects to Village 8 West. Runoff from Village 8 West does not drain onto Village 4 South. Instead, inlets within Village 8 West collect and direct runoff north towards a proposed water treatment basin before discharging into the Wolf Canyon tributary located immediately north of Village 4 South. See Exhibit 2, Proposed Condition Hydrology Map in Chapter 4. Water Quality and flow control (HMP) treatment of onsite Main Street runoff will be performed with the Village 4 South basin. For water quality and hydromodification discussion and calculations, please reference the *Priority Development Project (PDP) Storm Water Quality Management Plan (SWQMP) for Otay Ranch Portion of*

Village 4 Tentative Map dated August 2016 prepared by Hunsaker & Associates San Diego Inc.
In general, runoff from the developed site will drain north towards Main Street. Inlets placed throughout the site will collect the runoff and the storm drain will convey it towards the Main Street storm drain system. This storm drain system will convey flows west and then south before it reaches the future location of the proposed bridge abutment. It will outlet into the proposed basin located south of Main Street. The basin will consist of a riser with a rim height set to allow required ponding of the 'water quality' treatment design volume per the requirements set forth by the SDRWQCB Order R9-2013-0001. The basin's base will consist of 18" of engineered fill, 24" of gravel, and a perforated subdrain.

Table 2 below summarizes the 50 and 100-year developed condition peak flows at the location of the Wolf Canyon discharge including the effect of detention from the proposed basin. The discharge point at Wolf Canyon is shown on Exhibit 2 in Chapter 5. Runoff coefficients assumed for the proposed roads, multi-family development and single family development are per the City of Chula Vista Subdivision Manual.

TABLE 2 - Summary of Developed Flows to Otay River

Discharge Location	Drainage Area (ac)	50-Year Peak Flow (cfs)	100-Year Peak Flow (cfs)
Wolf Canyon	203.09	259.32	292.50

Supporting calculations for the information presented in Table 2 is located in Chapter 3 and 4 of this report. The corresponding hydrology map is Exhibit 2 in Chapter 5.

The storm drain outlet into the Wolf Canyon will require the design of an appropriate outlet structure to dissipate flow velocities. The outlet structure selected will reduce velocities downstream so as to not create an erosive situation. Options available include, but are not limited to, APWA energy dissipating impact basins, (SDRSD) D-41 Concrete Energy Dissipators, and rip rap energy dissipation.

Landform grading has been incorporated to mimic existing conditions where the proposed grading ties into or daylights with the existing terrain. It is intended that the stormwater from the manufactured slopes will sheet flow and follow the existing drainage patterns.

1.4 Results & Recommendations

Table 3 summarizes the effects of site development at the receiving Otay River.

TABLE 3 - Summary of Pre vs. Post-Developed Flows from Village 4 South

	PRE-DEVELOPED		POST-DEVELOPED		DIFFERENCE	
Discharge Location	**Drainage Area (ac)**	**100-Year Peak Flow (cfs)**	**Drainage Area (ac)**	**100-Year Peak Flow (cfs)**	**Area (ac)**	**100-Year Peak Flow (cfs)**
Wolf Canyon	201.4	295.29	203.09	292.50	+1.69*	-2.79

*-Increase in area is due to the basin area which was not included in the Existing Condition.

Development of Otay Ranch Village 4 South TM results in the net decrease of runoff discharged to Wolf Canyon of approximately 2.79 cfs when considering the effect of the proposed detention basin.

A comparison of the existing and proposed condition maps illustrates that there are finger canyons along the northern side of the site which show an area reduction, and thus flow reduction compared to the existing condition. Therefore, the potential for erosion has been greatly reduced immediately downstream of these finger canyons. Since the flows have been reduced for these subareas, existing flow velocities should not be exceeded once the site has been developed. Therefore, erosion is not expected at the downstream points of these subareas.

Erosion Control: The developer shall monitor any erosion at the project's outfall at Wolf Canyon and, prior to the last building permit for the project, obtain approval for and complete any reconstructive work necessary to eliminate any existing erosion and prevent future erosion from occurring, all to the satisfaction of the Development Services Director.

Scour Analysis: Concurrent with all grading plan submittals, the applicant shall prepare a scour analysis for all structures within the 100-year flood hazard area. Additionally, all said structures shall be monitored until the last building permit for the project has been issued.

Summary:

- Drainage facilities within Village 4 South will be designed in accordance with the requirements of the Chula Vista Subdivision Manual, the San Diego County Hydrology Manual and the requirements of the San Diego Regional Water Quality Control Board.

- Development of the project site will not further degrade potential beneficial uses of downstream water bodies as designated by the Regional Water Quality Control Board, including water bodies listed on the Clean Water Section 303d list.

- Onsite and offsite drainage easements shall be provided to the satisfaction of the Director of Public Works.

References

City of Chula Vista Subdivision Manual; Engineering Department and Land Development; Section 3-200, March 13, 2012

San Diego County Hydrology Manual; County of San Diego Department of Public Works Flood Control Division, June 2003

Hydromodification Management Plan prepared for County of San Diego, California, March 2011

Priority Development Project (PDP) Storm Water Quality Management Plan (SWQMP) for Otay Ranch Portion of Village 4 Tentative Map prepared by Hunsaker and Associates, San Diego Inc., August 2016.

"Order No. R9-2013-0001, NPDES No. CAS0109266 – Waste Discharge Requirements for Discharges of Urban Runoff from the Municipal Separate Storm Sewer Systems (MS4s) Draining the Watersheds of the County of San Diego, the Incorporated Cities of San Diego County, San Diego Unified Port District and the San Diego County Regional Airport Authority", California Regional Water Quality Control Board – San Diego Region.

CHAPTER 2 - METHODOLOGY

2.1 - Rational Method Model Development Summary

Computer Software Package – AES-2015

Design Storm – 50 for storm drain and 100-Year for detention and sump inlets

Land Use – Multi Family, Single Family, and Open Space

Soil Type - Hydrologic soil group D was assumed for all areas. Group D soils have very slow infiltration rates when thoroughly wetted. Consisting chiefly of clay soils with a high swelling potential, soils with a high permanent water table, soils with clay pan or clay layer at or near the surface, and shallow soils over nearly impervious materials, Group D soils have a very slow rate of water transmission.

Runoff Coefficient – In accordance with the City of Chula Vista Subdivision Manual, a runoff coefficient of 0.90 was used for fully paved areas, 0.75 for the Multi-Family Sites and dense residential, 0.65 for the Single-Family pads, 0.35 for proposed open space, and 0.30 for parks.

Method of Analysis – The Rational Method is the most widely used hydrologic model for estimating peak runoff rates. Applied to small urban and semi-urban areas with drainage areas less than 1.0 square mile, the Rational Method relates storm rainfall intensity, a runoff coefficient, and drainage area to peak runoff rate. This relationship is expressed by the equation:

Q = CIA, where:

Q = The peak runoff rate in cubic feet per second at the point of analysis.

C = A runoff coefficient representing the area - averaged ratio of runoff to rainfall intensity.

I = The time-averaged rainfall intensity in inches per hour corresponding to the time of concentration.

A = The drainage basin area in acres.

To perform a node-link study, the total watershed area is divided into subareas which discharge at designated nodes.

The procedure for the subarea summation model is as follows:

(1) Subdivide the watershed into an initial subarea (generally 1 lot) and subsequent subareas, which are generally less than 10 acres in size. Assign upstream and downstream node numbers to each subarea.

(2) Estimate an initial T_c by using the appropriate nomograph or overland flow velocity estimation.

(3) Using the initial T_c, determine the corresponding values of I. Then Q = C I A.

(4) Using Q, estimate the travel time between this node and the next by Manning's equation as applied to the particular channel or conduit linking the two nodes. Then, repeat the calculation for Q based on the revised intensity (which is a function of the revised time of concentration)

The nodes are joined together by links, which may be street gutter flows, drainage swales, drainage ditches, pipe flow, or various channel flows. The AES-2010 computer subarea menu is as follows:

SUBAREA HYDROLOGIC PROCESS

1. Confluence analysis at node.
2. Initial subarea analysis (including time of concentration calculation).
3. Pipeflow travel time (computer estimated).
4. Pipeflow travel time (user specified).
5. Trapezoidal channel travel time.
6. Street flow analysis through subarea.
7. User - specified information at node.
8. Addition of subarea runoff to main line.
9. V-gutter flow through area.
10. Copy main stream data to memory bank
11. Confluence main stream data with a memory bank
12. Clear a memory bank

At the confluence point of two or more basins, the following procedure is used to combine peak flow rates to account for differences in the basin's times of concentration. This adjustment is based on the assumption that each basin's hydrographs are triangular in shape.

(1). If the collection streams have the same times of concentration, then the Q values are directly summed,

$Q_p = Q_a + Q_b$; $T_p = T_a = T_b$

(2). If the collection streams have different times of concentration, the smaller of the tributary Q values may be adjusted as follows:

(i). The most frequent case is where the collection stream with the longer time of concentration has the larger Q. The smaller Q value is adjusted by the ratio of rainfall intensities.

$Q_p = Q_a + Q_b \ (I_a/I_b)$; $T_p = T_a$

(ii). In some cases, the collection stream with the shorter time of concentration has the larger Q. Then the smaller Q is adjusted by a ratio of the T values.

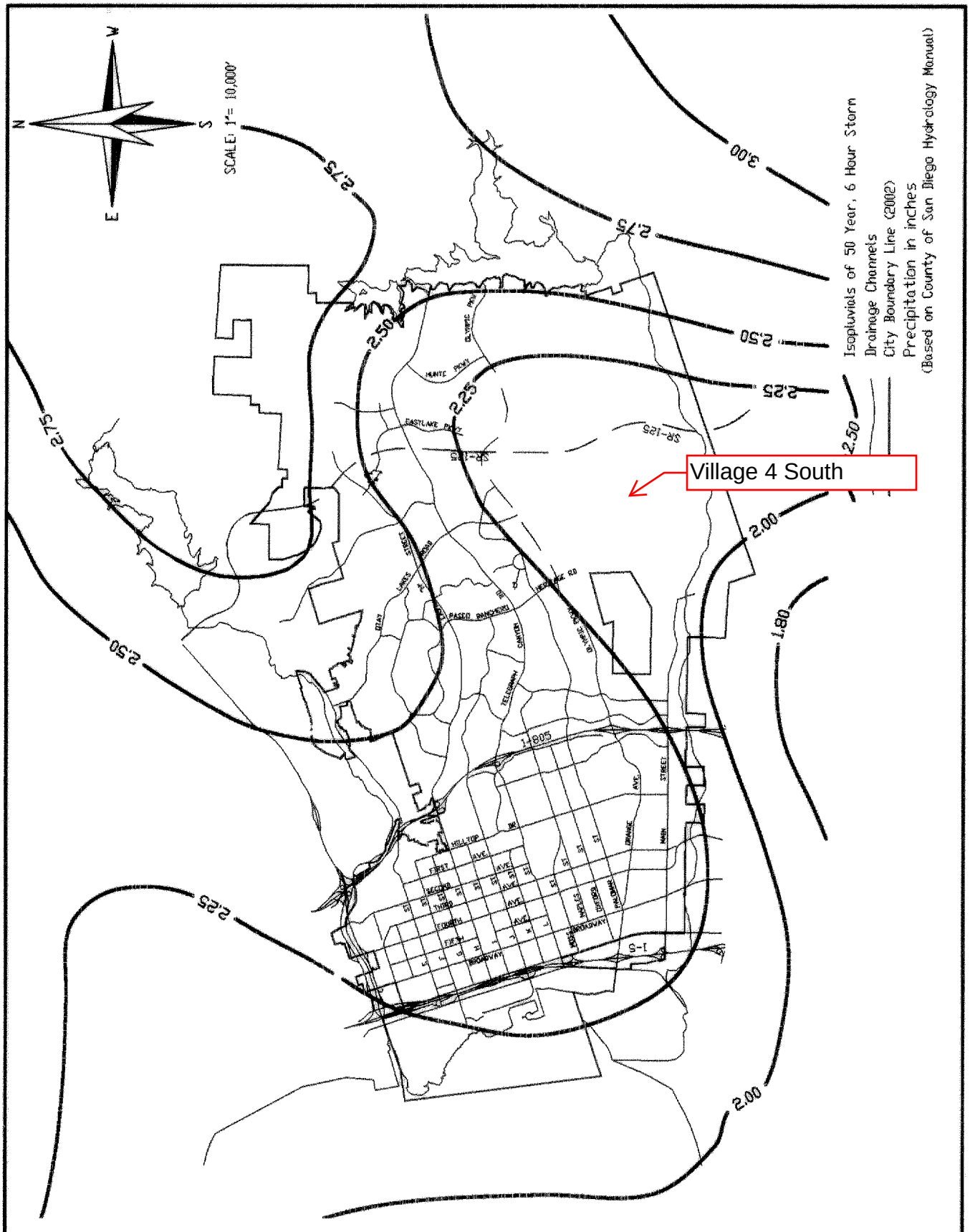
$Q_p = Q_b + Q_a \ (T_b/T_a)$; $T_p = T_b$

CHAPTER 2

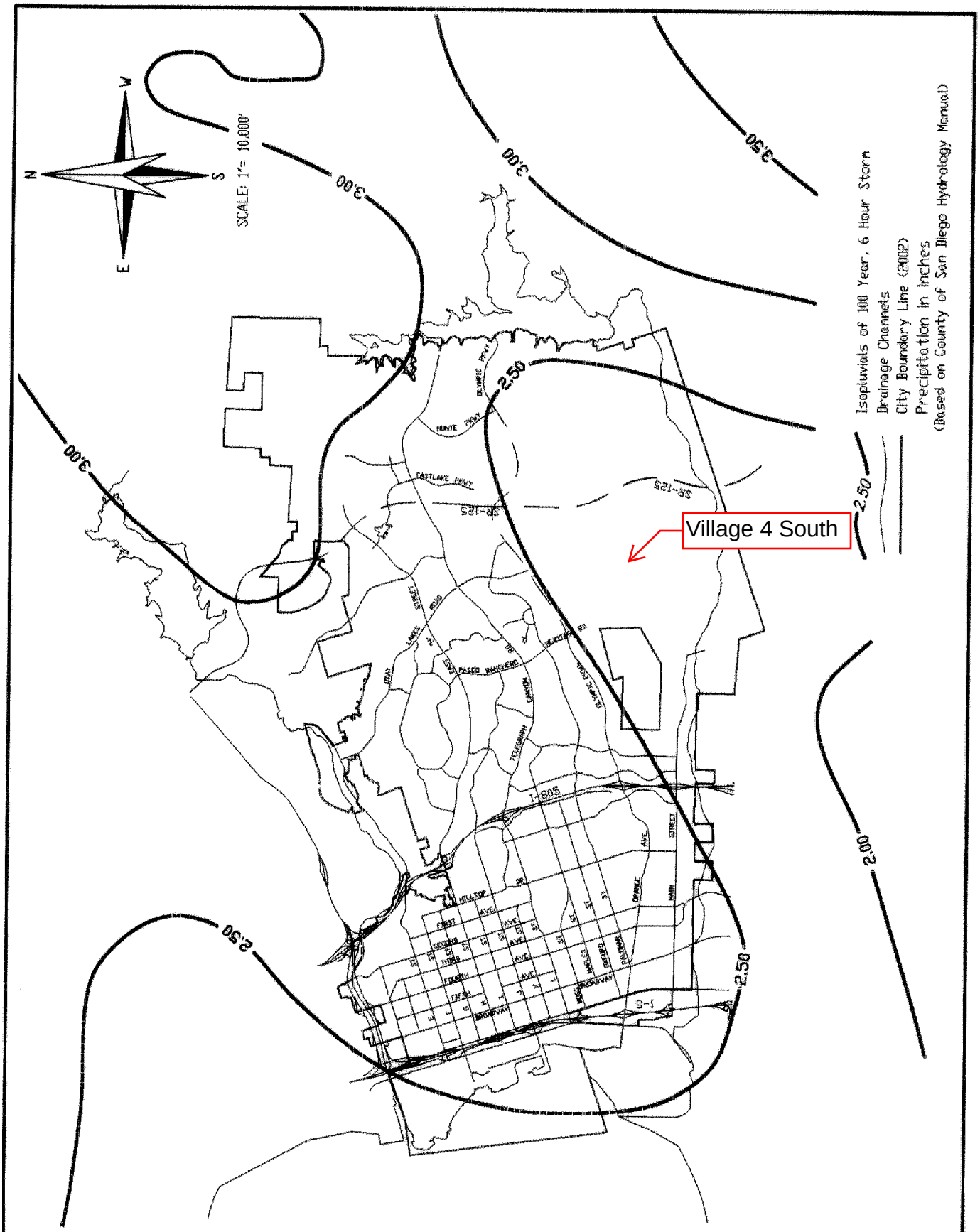
METHODOLOGY & MODEL DEVELOPMENT

2.2 – Design Rainfall Determination

50-Year, 6-Hour and 100-Year, 6-Hour Rainfall Isopluvial Maps from City of Chula Vista Design Standards – CVDS Storm Drain Design



Revised:	Original approval date: 01-29-02	CITY OF CHULA VISTA
M.P.M 2-02	Redrawn By: M.P.M Date: 01-29-02	PUBLIC WORKS DEPARTMENT
	Clifford Sherman	50 YEAR, 6 HOUR PRECIPITATION
	CITY ENGINEER Date: 11-7-02	CVD-DR04



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M.P.M 2-02	Redrawn By: C.V.M. Date: 01-29-02	PUBLIC WORKS DEPARTMENT	
	Bluffstakenson	100 YEAR, 6 HOUR PRECIPITATION	CVD-DR05
	CITY ENGINEER Date: 11-7-02		

CHAPTER 2

METHODOLOGY & MODEL DEVELOPMENT

2.3 – Runoff Coefficient Determination

3-203.3 **Rational and Modified Rational Methods**

(1) The rational method equation relates storm rainfall intensity (I), a selected runoff coefficient (C) and drainage area (A) to the peak runoff rate (Q):

$$Q = CIA \text{ (Empirical Units)}$$

where:

Q = Peak runoff in cubic feet per second
C = Runoff coefficient
I = Intensity, inches per hours
A = Drainage basin area in acres

Or

$$Q=0.278CIA \text{ (Metric Units)}$$

where:

Q = Peak runoff in cubic meters per second
C = Runoff coefficient
I = Intensity in millimeters per second
A = Drainage area in square kilometers

(2) Coefficient of Runoff: Consider probable development. Use highest number of the following values:

a)	Paved Surface	0.90
b)	Commercial Area	0.85
c)	Dense Residential (R2, R3)	0.75
d)	Normal Residential (R1)	0.65
e)	Suburban Property (RE)	0.55
f)	Barren Slopes Steep	0.80
g)	Barren Slopes Hilly	0.75
h)	" " Rolling	0.70
i)	" " Flat	0.65
j)	Vegetated Slopes Steep	0.60
k)	" " Hilly	0.55
l)	" " Rolling	0.50
m)	" " Flat	0.45
n)	Farm Land	0.35
o)	Parks, Golf Courses	0.30

NOTES:

Steep =	Steep, rugged terrain with average slopes generally above 30%.
Hilly =	Hilly terrain with average slopes of 10% to 30%.
Rolling =	Rolling terrain with average slopes of 5% to 10%.
Flat =	Relatively flat land, with average slopes of 0% to 5%.
Composite =	Where drainage areas are composed of parts having different runoff characteristics, a weighted coefficient for the total drainage area may be used.

CHAPTER 2

METHODOLOGY & MODEL DEVELOPMENT

2.4 – Rainfall Intensity Determination

-Maximum Overland Flow Length & Initial Time of Concentration

-Urban Watershed Overland Time of Flow Nomograph

-Gutter & Roadway Discharge-Velocity Chart

- Manning's Equation Nomograph

-Intensity-Duration Design Chart

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

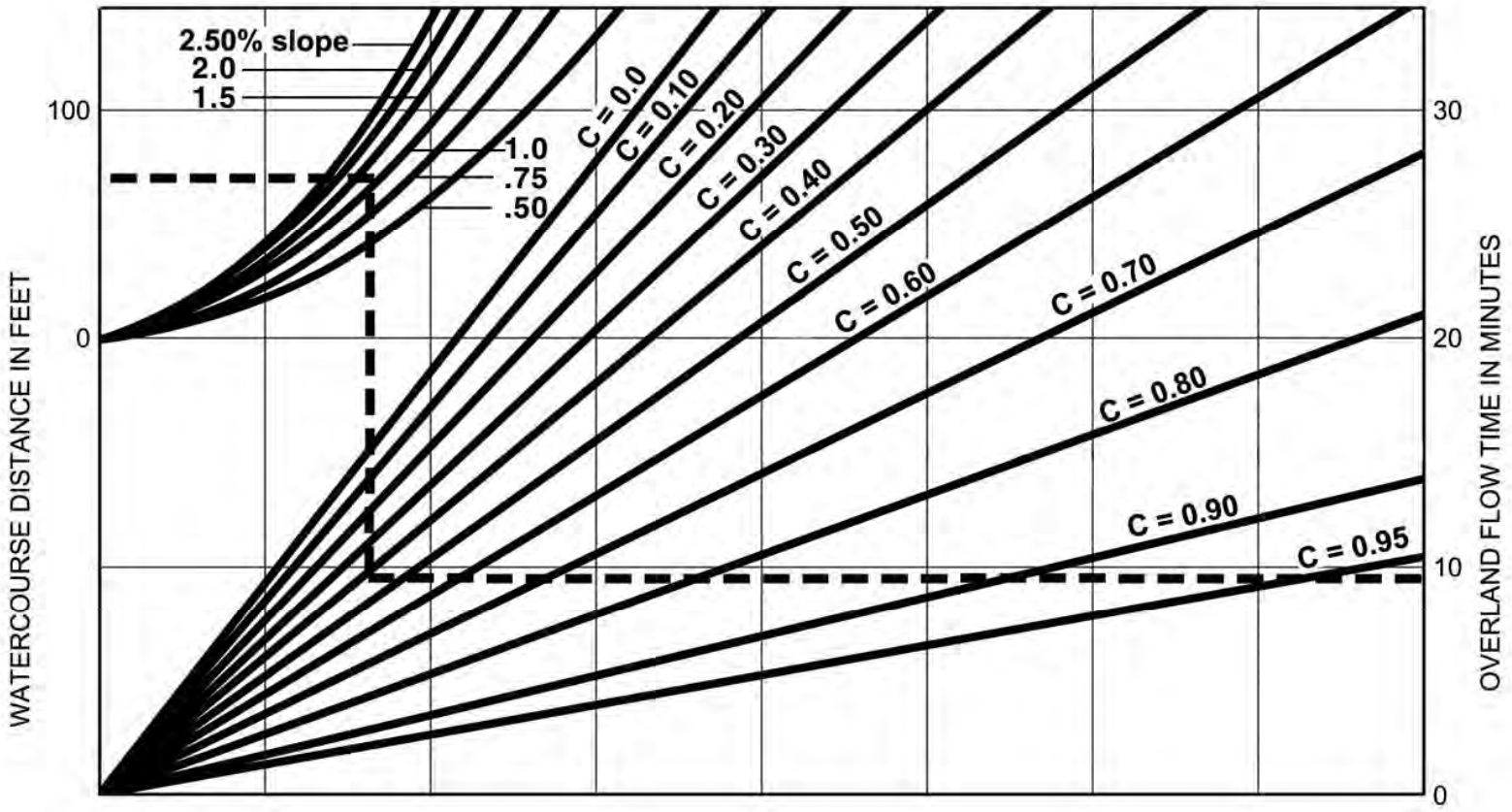
Table 3-2 provides limits of the length (Maximum Length (L_M)) of sheet flow to be used in hydrology studies. Initial T_i values based on average C values for the Land Use Element are also included. These values can be used in planning and design applications as described below. Exceptions may be approved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

Table 3-2

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

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

*See Table 3-1 for more detailed description



EXAMPLE:

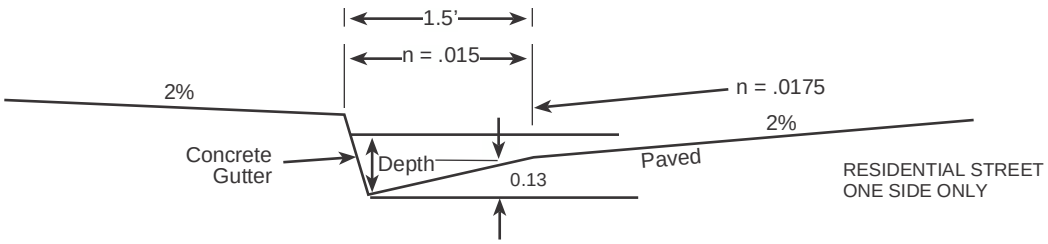
Given: Watercourse Distance (D) = 70 Feet
Slope (s) = 1.3%
Runoff Coefficient (C) = 0.41
Overland Flow Time (T) = 9.5 Minutes

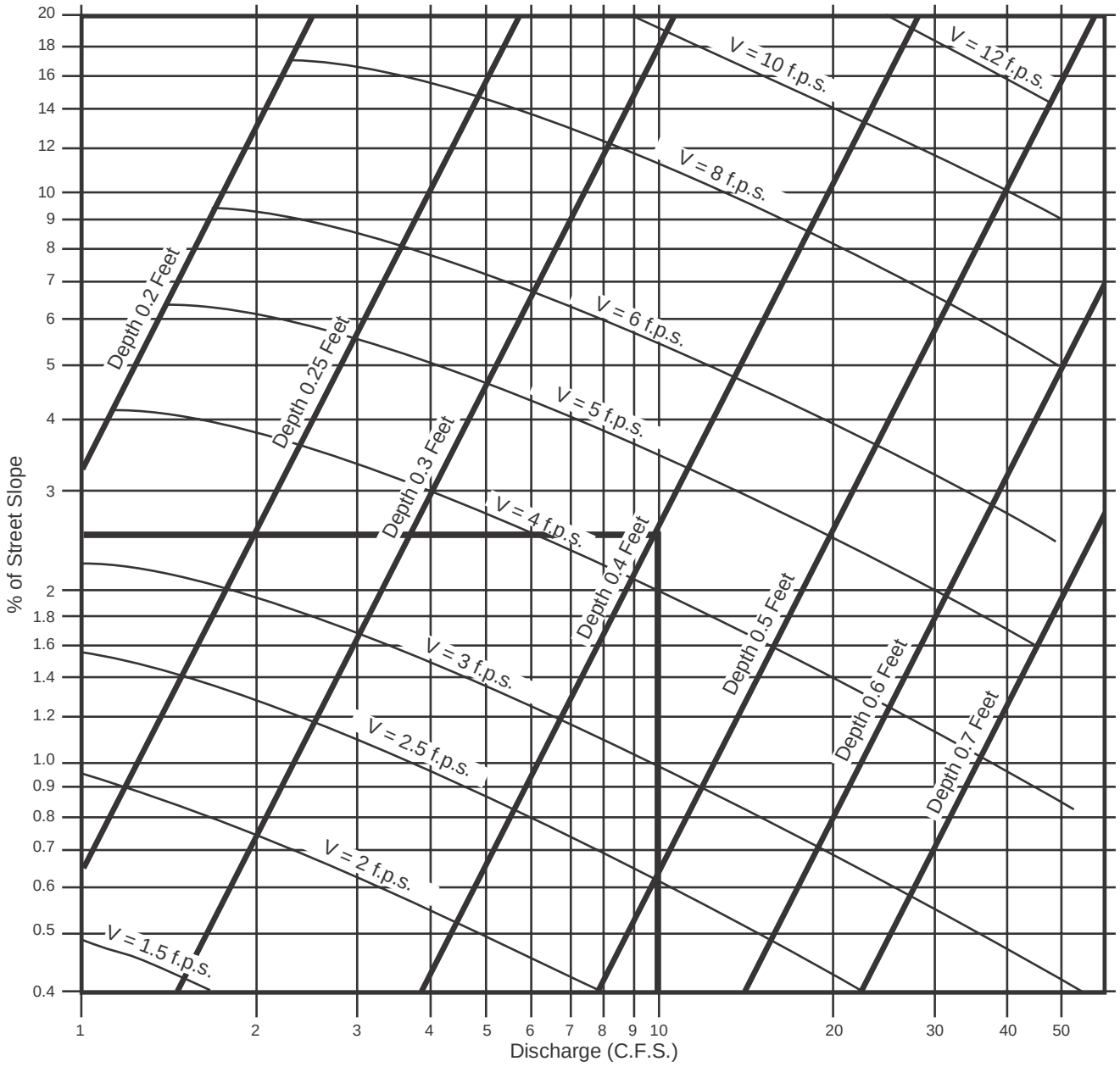
$$T = \frac{1.8\,(1.1-C)\sqrt{D}}{\sqrt[3]{s}}$$

SOURCE: Airport Drainage, Federal Aviation Administration, 1965

FIGURE 3-3

Rational Formula - Overland Time of Flow Nomograph





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

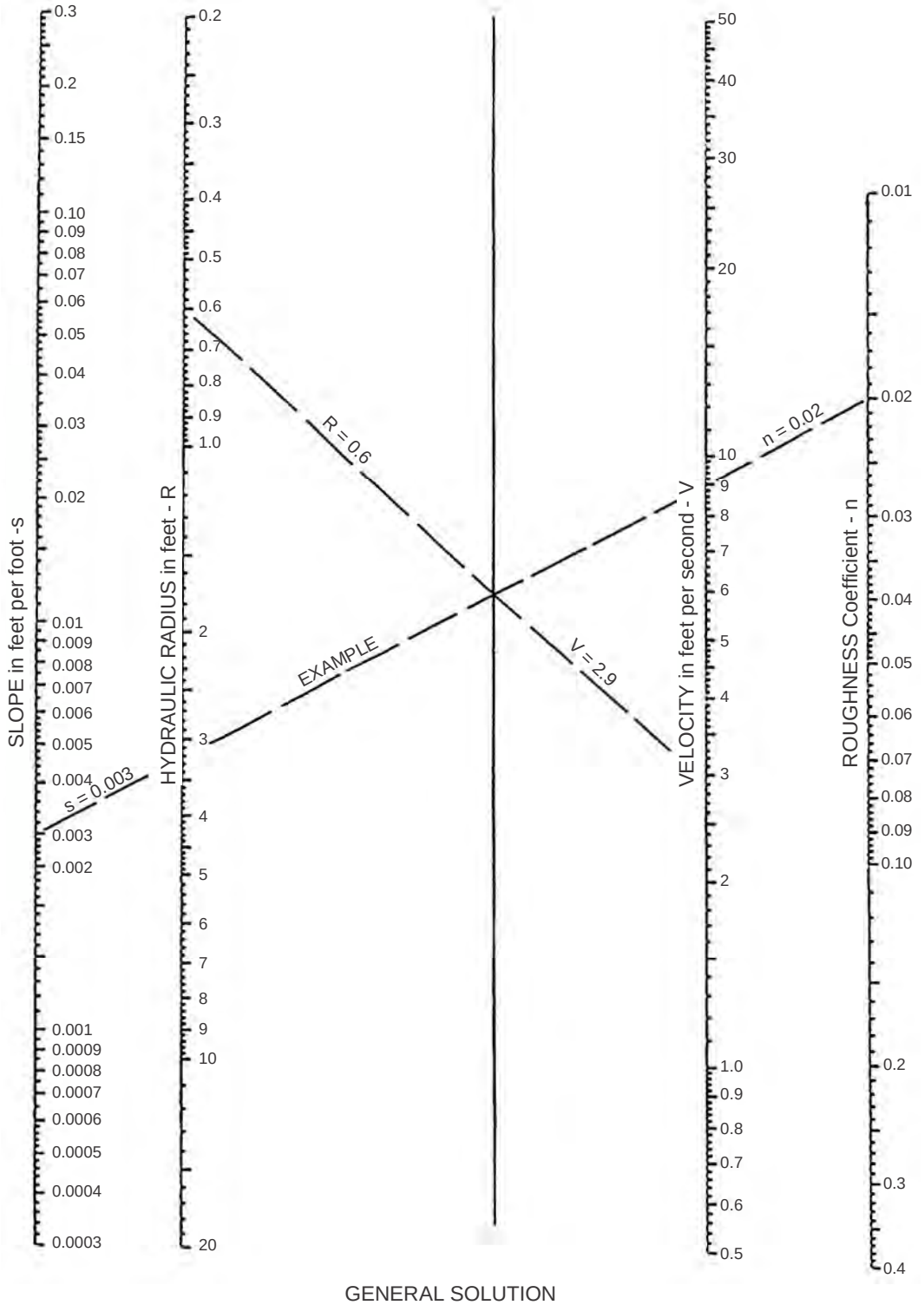
SOURCE: San Diego County Department of Special District Services Design Manual

F I G U R E

Gutter and Roadway Discharge - Velocity Chart

3-6

EQUATION: $V = \frac{1.49}{n} R^{2/3} s^{1/2}$



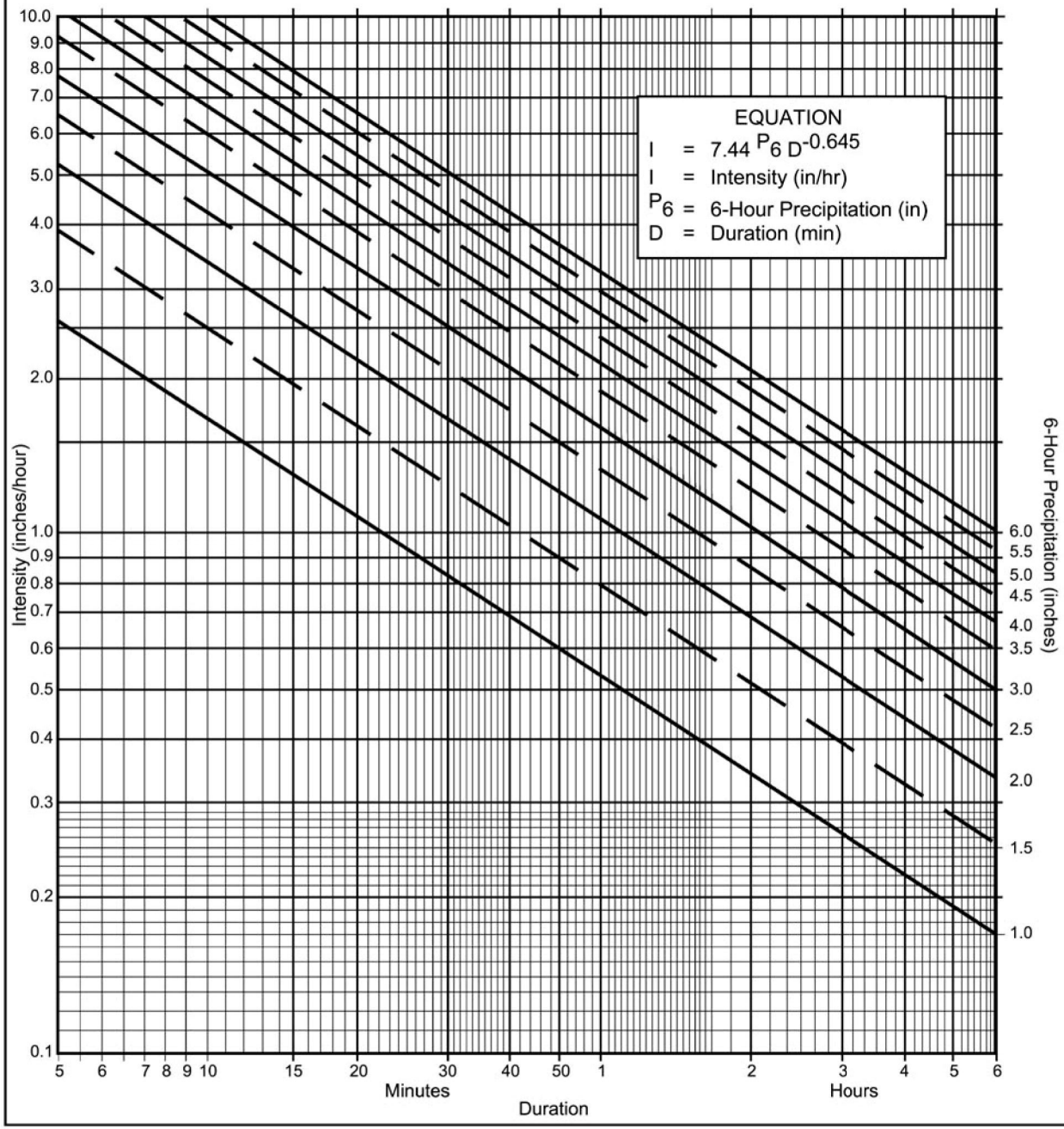
GENERAL SOLUTION

SOURCE: USDOT, FHWA, HDS-3 (1961)

FIGURE

Manning's Equation Nomograph

3-7



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency _____ year

(b) P_6 = _____ in., P_{24} = _____, $\frac{P_6}{P_{24}}$ = _____ %(2)

(c) Adjusted P_6(2) = _____ in.

(d) t_x = _____ min.

(e) I = _____ in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE 3-1

CHAPTER 3

HYDROLOGIC ANALYSIS

3.1 – 50-Year Existing Condition AES Model Output

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           RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                        2003,1985,1981 HYDROLOGY MANUAL
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                        Analysis prepared by:

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 ************************* DESCRIPTION OF STUDY *************************
* Otay Ranch Village 4 South                                            *
* 50-year return interval                                               *
* DLN: 0924,  W.O. 3206-0002                                            *
 **************************************************************************

  FILE NAME: R:\0924\HYD\CALCS\AES\EX50.DAT
  TIME/DATE OF STUDY: 15:57 02/26/2015
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =  50.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.130
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  =====  ======  =====  =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
  2   17.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  3   20.0     12.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  4   16.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  5   26.0     18.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  6   44.0     12.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    613.00
  DOWNSTREAM ELEVATION(FEET) =    607.00
  ELEVATION DIFFERENCE(FEET) =      6.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.953
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.612
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.37

**************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  53
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    607.00  DOWNSTREAM(FEET) =    435.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1033.00   CHANNEL SLOPE =  0.1665
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.37
  FLOW VELOCITY(FEET/SEC) =   2.29 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   7.53   Tc(MIN.) =   12.49
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =    1133.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
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```
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.110
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =    7.06   SUBAREA RUNOFF(CFS) =   13.17
  TOTAL AREA(ACRES) =        7.2   TOTAL RUNOFF(CFS) =      13.38
  TC(MIN.) =   12.49

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    435.00  DOWNSTREAM(FEET) =    280.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1203.00   CHANNEL SLOPE =  0.1288
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =      13.38
  FLOW VELOCITY(FEET/SEC) =   8.52 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.35   Tc(MIN.) =   14.84
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =    2336.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.782
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =   29.34   SUBAREA RUNOFF(CFS) =   48.97
  TOTAL AREA(ACRES) =       36.5   TOTAL RUNOFF(CFS) =      60.94
  TC(MIN.) =   14.84

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    113.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    280.00  DOWNSTREAM(FEET) =    269.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   480.00   CHANNEL SLOPE =  0.0229
  CHANNEL FLOW THRU SUBAREA(CFS) =      60.94
  FLOW VELOCITY(FEET/SEC) =   6.21 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.29   Tc(MIN.) =   16.13
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    113.00 =    2816.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    113.00 TO NODE    113.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   16.13
  RAINFALL INTENSITY(INCH/HR) =   2.64
  TOTAL STREAM AREA(ACRES) =    36.51
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     60.94

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    111.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    643.00
  DOWNSTREAM ELEVATION(FEET) =    633.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.178
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.612
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.30
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.30

****************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    633.00  DOWNSTREAM(FEET) =    390.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1383.00   CHANNEL SLOPE =  0.1757
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.30
  FLOW VELOCITY(FEET/SEC) =   2.35 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   9.82   Tc(MIN.) =   14.00
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 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    112.00 =    1483.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.889
 *USER SPECIFIED(SUBAREA):
 VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
 SUBAREA AREA(ACRES) =   17.23   SUBAREA RUNOFF(CFS) =   29.87
 TOTAL AREA(ACRES) =       17.3   TOTAL RUNOFF(CFS) =      30.02
 TC(MIN.) =   14.00

****************************************************************************
 FLOW PROCESS FROM NODE    112.00 TO NODE    113.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    390.00  DOWNSTREAM(FEET) =    269.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =  1243.00   CHANNEL SLOPE =  0.0973
 CHANNEL FLOW THRU SUBAREA(CFS) =      30.02
 FLOW VELOCITY(FEET/SEC) =  10.45 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   1.98   Tc(MIN.) =   15.98
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    113.00 =    2726.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    112.00 TO NODE    113.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.652
 *USER SPECIFIED(SUBAREA):
 VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
 SUBAREA AREA(ACRES) =   19.29   SUBAREA RUNOFF(CFS) =   30.70
 TOTAL AREA(ACRES) =       36.6   TOTAL RUNOFF(CFS) =      58.26
 TC(MIN.) =   15.98

****************************************************************************
 FLOW PROCESS FROM NODE    113.00 TO NODE    113.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =   15.98
 RAINFALL INTENSITY(INCH/HR) =   2.65
 TOTAL STREAM AREA(ACRES) =    36.61
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     58.26

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       60.94    16.13        2.636         36.51
     2       58.26    15.98        2.652         36.61

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1      118.63    15.98       2.652
     2      118.85    16.13       2.636

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =     118.85   Tc(MIN.) =   16.13
 TOTAL AREA(ACRES) =       73.1
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    113.00 =    2816.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    113.00 TO NODE    123.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    269.00  DOWNSTREAM(FEET) =    236.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   972.00   CHANNEL SLOPE =  0.0340
 CHANNEL FLOW THRU SUBAREA(CFS) =     118.85
 FLOW VELOCITY(FEET/SEC) =   9.21 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   1.76   Tc(MIN.) =   17.89
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    123.00 =    3788.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    123.00 TO NODE    123.00 IS CODE =   1
----------------------------------------------------------------------------
```

```
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   17.89
  RAINFALL INTENSITY(INCH/HR) =   2.47
  TOTAL STREAM AREA(ACRES) =    73.12
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    118.85

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    121.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    530.00
  DOWNSTREAM ELEVATION(FEET) =    520.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.178
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.612
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.40
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.40

****************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    520.00  DOWNSTREAM(FEET) =    325.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1285.00   CHANNEL SLOPE =  0.1518
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.40
  FLOW VELOCITY(FEET/SEC) =   2.18 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   9.82   Tc(MIN.) =   14.00
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    122.00 =    1385.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.889
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =   14.79   SUBAREA RUNOFF(CFS) =   25.64
  TOTAL AREA(ACRES) =       14.9   TOTAL RUNOFF(CFS) =      25.85
  TC(MIN.) =   14.00

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    123.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    325.00  DOWNSTREAM(FEET) =    236.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1065.00   CHANNEL SLOPE =  0.0836
  CHANNEL FLOW THRU SUBAREA(CFS) =      25.85
  FLOW VELOCITY(FEET/SEC) =   9.29 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.91   Tc(MIN.) =   15.91
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    123.00 =    2450.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    123.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.660
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =   25.97   SUBAREA RUNOFF(CFS) =   41.45
  TOTAL AREA(ACRES) =       40.9   TOTAL RUNOFF(CFS) =      65.25
  TC(MIN.) =   15.91

****************************************************************************
  FLOW PROCESS FROM NODE    123.00 TO NODE    123.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
==============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   15.91
  RAINFALL INTENSITY(INCH/HR) =   2.66
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  TOTAL STREAM AREA(ACRES) =    40.88
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     65.25

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1      118.85    17.89        2.466         73.12
      2       65.25    15.91        2.660         40.88

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1      175.43    15.91       2.660
      2      179.34    17.89       2.466

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     179.34   Tc(MIN.) =   17.89
  TOTAL AREA(ACRES) =      114.0
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    123.00 =    3788.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    123.00 TO NODE    124.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    236.00  DOWNSTREAM(FEET) =    200.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1970.00   CHANNEL SLOPE =  0.0183
  CHANNEL FLOW THRU SUBAREA(CFS) =     179.34
  FLOW VELOCITY(FEET/SEC) =   7.67 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   4.28   Tc(MIN.) =   22.17
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    124.00 =    5758.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    123.00 TO NODE    124.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.147
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =   19.96   SUBAREA RUNOFF(CFS) =   25.72
  TOTAL AREA(ACRES) =      134.0   TOTAL RUNOFF(CFS) =     179.34
  TC(MIN.) =   22.17
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE    124.00 TO NODE    124.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   22.17
  RAINFALL INTENSITY(INCH/HR) =   2.15
  TOTAL STREAM AREA(ACRES) =   133.96
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    179.34

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    131.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    650.00
  DOWNSTREAM ELEVATION(FEET) =    640.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.178
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.612
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.58
  TOTAL AREA(ACRES) =      0.47   TOTAL RUNOFF(CFS) =      1.58

****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    132.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    640.00  DOWNSTREAM(FEET) =    450.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1167.00   CHANNEL SLOPE =  0.1628
  CHANNEL FLOW THRU SUBAREA(CFS) =       1.58
  FLOW VELOCITY(FEET/SEC) =   2.63 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
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  TRAVEL TIME(MIN.) =   7.39   Tc(MIN.) =   11.57
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    132.00 =    1267.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    132.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.268
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =   18.69   SUBAREA RUNOFF(CFS) =   36.64
  TOTAL AREA(ACRES) =       19.2   TOTAL RUNOFF(CFS) =      37.56
  TC(MIN.) =   11.57

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    133.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    450.00  DOWNSTREAM(FEET) =    360.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1271.00   CHANNEL SLOPE =  0.0708
  CHANNEL FLOW THRU SUBAREA(CFS) =      37.56
  FLOW VELOCITY(FEET/SEC) =   9.49 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.23   Tc(MIN.) =   13.80
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    133.00 =    2538.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    133.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.916
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =   25.58   SUBAREA RUNOFF(CFS) =   44.75
  TOTAL AREA(ACRES) =       44.7   TOTAL RUNOFF(CFS) =      78.28
  TC(MIN.) =   13.80

****************************************************************************
  FLOW PROCESS FROM NODE    133.00 TO NODE    124.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    360.00  DOWNSTREAM(FEET) =    200.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1666.00   CHANNEL SLOPE =  0.0960
  CHANNEL FLOW THRU SUBAREA(CFS) =      78.28
  FLOW VELOCITY(FEET/SEC) =   7.41 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   3.75   Tc(MIN.) =   17.54
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    124.00 =    4204.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    133.00 TO NODE    124.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.498
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =   22.68   SUBAREA RUNOFF(CFS) =   33.99
  TOTAL AREA(ACRES) =       67.4   TOTAL RUNOFF(CFS) =     101.03
  TC(MIN.) =   17.54

****************************************************************************
  FLOW PROCESS FROM NODE    124.00 TO NODE    124.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   17.54
  RAINFALL INTENSITY(INCH/HR) =   2.50
  TOTAL STREAM AREA(ACRES) =    67.42
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    101.03

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1      179.34    22.17        2.147        133.96
      2      101.03    17.54        2.498         67.42

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.
```

```
  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1      255.23    17.54       2.498
      2      266.21    22.17       2.147

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     266.21   Tc(MIN.) =   22.17
  TOTAL AREA(ACRES) =      201.4
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    124.00 =    5758.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =      201.4  TC(MIN.) =     22.17
  PEAK FLOW RATE(CFS)   =     266.21
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

CHAPTER 3

HYDROLOGIC ANALYSIS

3.2 – 100-Year Existing Condition AES Model Output

```
**************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2010 Advanced Engineering Software (aes)
              Ver. 17.0 Release Date: 07/01/2010  License ID 1239

                          Analysis prepared by:

                    Hunsaker & Associates San Diego, Inc.
                             9707 Waples Street
                            San Diego,  CA  92121


 ************************* DESCRIPTION OF STUDY *************************
* Otay Ranch village 4 South                                             *
* 100-year return interval                                               *
* DLN 0924,  W.O. 3206-0002                                              *
 **************************************************************************

  FILE NAME: R:\0924\HYD\CALCS\AES\EX100.DAT
  TIME/DATE OF STUDY: 16:06 02/26/2015
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.350
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
  2   17.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  3   20.0     12.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  4   16.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  5   26.0     18.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  6   44.0     12.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    613.00
  DOWNSTREAM ELEVATION(FEET) =    607.00
  ELEVATION DIFFERENCE(FEET) =      6.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.953
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.41

**************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  53
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    607.00  DOWNSTREAM(FEET) =    435.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1033.00   CHANNEL SLOPE =  0.1665
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.41
  FLOW VELOCITY(FEET/SEC) =   2.29 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   7.53   Tc(MIN.) =   12.49
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =    1133.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
```

```
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.431
 *USER SPECIFIED(SUBAREA):
 VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
 SUBAREA AREA(ACRES) =    7.06   SUBAREA RUNOFF(CFS) =   14.53
 TOTAL AREA(ACRES) =        7.2   TOTAL RUNOFF(CFS) =      14.76
 TC(MIN.) =   12.49

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    435.00  DOWNSTREAM(FEET) =    280.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =  1203.00   CHANNEL SLOPE =  0.1288
 NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
 CHANNEL FLOW THRU SUBAREA(CFS) =      14.76
 FLOW VELOCITY(FEET/SEC) =   8.74 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   2.29   Tc(MIN.) =   14.78
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =    2336.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.077
 *USER SPECIFIED(SUBAREA):
 VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
 SUBAREA AREA(ACRES) =   29.34   SUBAREA RUNOFF(CFS) =   54.17
 TOTAL AREA(ACRES) =       36.5   TOTAL RUNOFF(CFS) =      67.41
 TC(MIN.) =   14.78

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    113.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    280.00  DOWNSTREAM(FEET) =    269.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   480.00   CHANNEL SLOPE =  0.0229
 CHANNEL FLOW THRU SUBAREA(CFS) =      67.41
 FLOW VELOCITY(FEET/SEC) =   6.39 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   1.25   Tc(MIN.) =   16.03
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    113.00 =    2816.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    113.00 TO NODE    113.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   16.03
 RAINFALL INTENSITY(INCH/HR) =   2.92
 TOTAL STREAM AREA(ACRES) =    36.51
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     67.41

****************************************************************************
 FLOW PROCESS FROM NODE    110.00 TO NODE    111.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
 UPSTREAM ELEVATION(FEET) =    643.00
 DOWNSTREAM ELEVATION(FEET) =    633.00
 ELEVATION DIFFERENCE(FEET) =     10.00
 URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.178
 WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.33
 TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.33

****************************************************************************
 FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  53
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    633.00  DOWNSTREAM(FEET) =    390.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =  1383.00   CHANNEL SLOPE =  0.1757
 NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
 CHANNEL FLOW THRU SUBAREA(CFS) =       0.33
 FLOW VELOCITY(FEET/SEC) =   2.35 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   9.82   Tc(MIN.) =   14.00
```

```
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    112.00 =    1483.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.187
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =   17.23   SUBAREA RUNOFF(CFS) =   32.95
  TOTAL AREA(ACRES) =       17.3   TOTAL RUNOFF(CFS) =      33.12
  TC(MIN.) =   14.00

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    113.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    390.00  DOWNSTREAM(FEET) =    269.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1243.00   CHANNEL SLOPE =  0.0973
  CHANNEL FLOW THRU SUBAREA(CFS) =      33.12
  FLOW VELOCITY(FEET/SEC) =  10.74 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.93   Tc(MIN.) =   15.93
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    113.00 =    2726.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    113.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.933
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =   19.29   SUBAREA RUNOFF(CFS) =   33.94
  TOTAL AREA(ACRES) =       36.6   TOTAL RUNOFF(CFS) =      64.42
  TC(MIN.) =   15.93

****************************************************************************
  FLOW PROCESS FROM NODE    113.00 TO NODE    113.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   15.93
  RAINFALL INTENSITY(INCH/HR) =   2.93
  TOTAL STREAM AREA(ACRES) =    36.61
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     64.42

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       67.41    16.03        2.920         36.51
      2       64.42    15.93        2.933         36.61

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1      131.38    15.93       2.933
      2      131.55    16.03       2.920

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     131.55   Tc(MIN.) =   16.03
  TOTAL AREA(ACRES) =       73.1
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    113.00 =    2816.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    113.00 TO NODE    123.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    269.00  DOWNSTREAM(FEET) =    236.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   972.00   CHANNEL SLOPE =  0.0340
  CHANNEL FLOW THRU SUBAREA(CFS) =     131.55
  FLOW VELOCITY(FEET/SEC) =   9.50 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.70   Tc(MIN.) =   17.74
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    123.00 =    3788.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    123.00 TO NODE    123.00 IS CODE =   1
----------------------------------------------------------------------------
```

```
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   17.74
  RAINFALL INTENSITY(INCH/HR) =   2.74
  TOTAL STREAM AREA(ACRES) =    73.12
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    131.55

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    121.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    530.00
  DOWNSTREAM ELEVATION(FEET) =    520.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.178
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.45
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.45

****************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    520.00  DOWNSTREAM(FEET) =    325.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1285.00   CHANNEL SLOPE =  0.1518
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.45
  FLOW VELOCITY(FEET/SEC) =   2.18 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   9.82   Tc(MIN.) =   14.00
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    122.00 =    1385.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.188
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =   14.79   SUBAREA RUNOFF(CFS) =   28.29
  TOTAL AREA(ACRES) =       14.9   TOTAL RUNOFF(CFS) =      28.52
  TC(MIN.) =   14.00

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    123.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    325.00  DOWNSTREAM(FEET) =    236.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1065.00   CHANNEL SLOPE =  0.0836
  CHANNEL FLOW THRU SUBAREA(CFS) =      28.52
  FLOW VELOCITY(FEET/SEC) =   9.55 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.86   Tc(MIN.) =   15.85
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    123.00 =    2450.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    123.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.941
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =   25.97   SUBAREA RUNOFF(CFS) =   45.83
  TOTAL AREA(ACRES) =       40.9   TOTAL RUNOFF(CFS) =      72.14
  TC(MIN.) =   15.85

****************************************************************************
  FLOW PROCESS FROM NODE    123.00 TO NODE    123.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   15.85
  RAINFALL INTENSITY(INCH/HR) =   2.94
```

```
  TOTAL STREAM AREA(ACRES) =    40.88
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     72.14

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1      131.55    17.74        2.736         73.12
      2       72.14    15.85        2.941         40.88

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1      194.51    15.85       2.941
      2      198.66    17.74       2.736

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     198.66   Tc(MIN.) =   17.74
  TOTAL AREA(ACRES) =      114.0
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    123.00 =    3788.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    123.00 TO NODE    124.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    236.00  DOWNSTREAM(FEET) =    200.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1970.00   CHANNEL SLOPE =  0.0183
  CHANNEL FLOW THRU SUBAREA(CFS) =     198.66
  FLOW VELOCITY(FEET/SEC) =   7.91 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   4.15   Tc(MIN.) =   21.89
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    124.00 =    5758.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    123.00 TO NODE    124.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.389
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =   19.96   SUBAREA RUNOFF(CFS) =   28.61
  TOTAL AREA(ACRES) =      134.0   TOTAL RUNOFF(CFS) =     198.66
  TC(MIN.) =   21.89
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE    124.00 TO NODE    124.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   21.89
  RAINFALL INTENSITY(INCH/HR) =   2.39
  TOTAL STREAM AREA(ACRES) =   133.96
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    198.66

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    131.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    650.00
  DOWNSTREAM ELEVATION(FEET) =    640.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.178
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.75
  TOTAL AREA(ACRES) =      0.47   TOTAL RUNOFF(CFS) =      1.75

****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    132.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    640.00  DOWNSTREAM(FEET) =    450.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1167.00   CHANNEL SLOPE =  0.1628
  CHANNEL FLOW THRU SUBAREA(CFS) =       1.75
  FLOW VELOCITY(FEET/SEC) =   2.72 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
```

```
  TRAVEL TIME(MIN.) =   7.15   Tc(MIN.) =   11.33
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    132.00 =    1267.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    132.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.654
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =   18.69   SUBAREA RUNOFF(CFS) =   40.97
  TOTAL AREA(ACRES) =       19.2   TOTAL RUNOFF(CFS) =      42.00
  TC(MIN.) =   11.33

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    133.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    450.00  DOWNSTREAM(FEET) =    360.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1271.00   CHANNEL SLOPE =  0.0708
  CHANNEL FLOW THRU SUBAREA(CFS) =      42.00
  FLOW VELOCITY(FEET/SEC) =   9.80 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.16   Tc(MIN.) =   13.49
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    133.00 =    2538.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    133.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.264
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =   25.58   SUBAREA RUNOFF(CFS) =   50.10
  TOTAL AREA(ACRES) =       44.7   TOTAL RUNOFF(CFS) =      87.63
  TC(MIN.) =   13.49

****************************************************************************
  FLOW PROCESS FROM NODE    133.00 TO NODE    124.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    360.00  DOWNSTREAM(FEET) =    200.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1666.00   CHANNEL SLOPE =  0.0960
  CHANNEL FLOW THRU SUBAREA(CFS) =      87.63
  FLOW VELOCITY(FEET/SEC) =   7.70 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   3.61   Tc(MIN.) =   17.10
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    124.00 =    4204.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    133.00 TO NODE    124.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.802
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =   22.68   SUBAREA RUNOFF(CFS) =   38.12
  TOTAL AREA(ACRES) =       67.4   TOTAL RUNOFF(CFS) =     113.33
  TC(MIN.) =   17.10

****************************************************************************
  FLOW PROCESS FROM NODE    124.00 TO NODE    124.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   17.10
  RAINFALL INTENSITY(INCH/HR) =   2.80
  TOTAL STREAM AREA(ACRES) =    67.42
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    113.33

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1      198.66    21.89        2.389        133.96
      2      113.33    17.10        2.802         67.42

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.
```

```
  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1      282.73    17.10       2.802
      2      295.29    21.89       2.389

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     295.29   Tc(MIN.) =   21.89
  TOTAL AREA(ACRES) =      201.4
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    124.00 =    5758.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =      201.4  TC(MIN.) =     21.89
  PEAK FLOW RATE(CFS)   =     295.29
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

CHAPTER 3

HYDROLOGIC ANALYSIS

3.3 – 50-Year Developed Condition AES Model Output

```
**************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2015 Advanced Engineering Software (aes)
              Ver. 22.0 Release Date: 07/01/2015  License ID 1239

                           Analysis prepared by:




 ************************* DESCRIPTION OF STUDY *************************
* Otay Ranch Village 4 South                                             *
* 50-year return interval                                                *
* DLN:0924,  W.O. 3206-0002                                              *
 **************************************************************************

  FILE NAME: R:\0924\HYD\CALCS\AES\PR50.DAT
  TIME/DATE OF STUDY: 11:34 06/22/2016
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =  50.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.130
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
  2   17.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  3   20.0     12.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  4   16.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  5   26.0     18.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  6   44.0     12.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    60.00
  UPSTREAM ELEVATION(FEET) =    437.63
  DOWNSTREAM ELEVATION(FEET) =    437.02
  ELEVATION DIFFERENCE(FEET) =      0.61
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.467
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.612
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.96
  TOTAL AREA(ACRES) =      0.41   TOTAL RUNOFF(CFS) =      1.96

**************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  62
--------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  6 USED)<<<<<
```

```
==========================================================================
  UPSTREAM ELEVATION(FEET) =  437.02  DOWNSTREAM ELEVATION(FEET) =  432.91
  STREET LENGTH(FEET) =   413.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 44.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  12.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.00
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.33
    HALFSTREET FLOOD WIDTH(FEET) =    9.99
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.24
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.73
  STREET FLOW TRAVEL TIME(MIN.) =   3.07   Tc(MIN.) =    6.54
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.722
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  SUBAREA AREA(ACRES) =    1.51      SUBAREA RUNOFF(CFS) =    6.06
  TOTAL AREA(ACRES) =        1.9        PEAK FLOW RATE(CFS) =       7.71

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.37   HALFSTREET FLOOD WIDTH(FEET) =  12.01
  FLOW VELOCITY(FEET/SEC.) =  2.47   DEPTH*VELOCITY(FT*FT/SEC.) =   0.90
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     473.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   428.00  DOWNSTREAM(FEET) =   427.00
  FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   9.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.16
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.71
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    6.64
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =     523.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    111.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    525.00
  DOWNSTREAM ELEVATION(FEET) =    515.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.178
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.612
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  31
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   515.00  DOWNSTREAM(FEET) =   451.00
  FLOW LENGTH(FEET) =   548.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   1.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.36
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.37
  PIPE TRAVEL TIME(MIN.) =   1.44    Tc(MIN.) =    5.61
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    112.00 =     648.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.208
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =    2.16   SUBAREA RUNOFF(CFS) =    6.75
  TOTAL AREA(ACRES) =        2.3   TOTAL RUNOFF(CFS) =       7.09
  TC(MIN.) =    5.61

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    117.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   446.00  DOWNSTREAM(FEET) =   435.00
  FLOW LENGTH(FEET) =   254.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.63
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.09
  PIPE TRAVEL TIME(MIN.) =   0.40    Tc(MIN.) =    6.01
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    117.00 =     902.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    117.00 TO NODE    117.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.01
  RAINFALL INTENSITY(INCH/HR) =   4.98
  TOTAL STREAM AREA(ACRES) =     2.27
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.09

****************************************************************************
  FLOW PROCESS FROM NODE    115.00 TO NODE    116.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    526.45
  DOWNSTREAM ELEVATION(FEET) =    525.80
  ELEVATION DIFFERENCE(FEET) =      0.65
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.079
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.555
  SUBAREA RUNOFF(CFS) =      1.12
  TOTAL AREA(ACRES) =      0.27   TOTAL RUNOFF(CFS) =      1.12

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    117.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
```

```
  UPSTREAM ELEVATION(FEET) =  525.80  DOWNSTREAM ELEVATION(FEET) =  438.25
  STREET LENGTH(FEET) =   721.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   8.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       8.49
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.27
    HALFSTREET FLOOD WIDTH(FEET) =    7.21
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    6.65
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.80
  STREET FLOW TRAVEL TIME(MIN.) =   1.81   Tc(MIN.) =    6.89
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.565
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.750
  SUBAREA AREA(ACRES) =    4.28      SUBAREA RUNOFF(CFS) =   14.65
  TOTAL AREA(ACRES) =        4.6        PEAK FLOW RATE(CFS) =      15.58

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =   9.53
  FLOW VELOCITY(FEET/SEC.) =  7.59   DEPTH*VELOCITY(FT*FT/SEC.) =   2.40
  LONGEST FLOWPATH FROM NODE    115.00 TO NODE    117.00 =     786.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    117.00 TO NODE    117.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.89
  RAINFALL INTENSITY(INCH/HR) =   4.57
  TOTAL STREAM AREA(ACRES) =     4.55
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     15.58

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        7.09     6.01        4.983          2.27
      2       15.58     6.89        4.565          4.55

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       20.70     6.01       4.983
      2       22.08     6.89       4.565

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      22.08   Tc(MIN.) =    6.89
  TOTAL AREA(ACRES) =        6.8
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    117.00 =     902.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    117.00 TO NODE    118.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   433.00  DOWNSTREAM(FEET) =   427.00
  FLOW LENGTH(FEET) =   272.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  17.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.58
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
```

```
  PIPE-FLOW(CFS) =      22.08
  PIPE TRAVEL TIME(MIN.) =   0.43    Tc(MIN.) =    7.31
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    118.00 =    1174.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    118.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.31
  RAINFALL INTENSITY(INCH/HR) =   4.39
  TOTAL STREAM AREA(ACRES) =     6.82
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     22.08

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    121.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    451.55
  DOWNSTREAM ELEVATION(FEET) =    450.90
  ELEVATION DIFFERENCE(FEET) =      0.65
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.079
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.555
  SUBAREA RUNOFF(CFS) =      1.29
  TOTAL AREA(ACRES) =      0.31   TOTAL RUNOFF(CFS) =      1.29

****************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  446.20  DOWNSTREAM ELEVATION(FEET) =  430.50
  STREET LENGTH(FEET) =   446.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   8.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.12
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.29
    HALFSTREET FLOOD WIDTH(FEET) =    8.28
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.81
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.11
  STREET FLOW TRAVEL TIME(MIN.) =   1.95   Tc(MIN.) =    7.03
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.504
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.750
  SUBAREA AREA(ACRES) =    2.84      SUBAREA RUNOFF(CFS) =    9.59
  TOTAL AREA(ACRES) =        3.1        PEAK FLOW RATE(CFS) =      10.64

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =  10.53
  FLOW VELOCITY(FEET/SEC.) =  4.34   DEPTH*VELOCITY(FT*FT/SEC.) =   1.46
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    122.00 =     511.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  81
```

```
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.504
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (HILLY) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7402
  SUBAREA AREA(ACRES) =    0.22   SUBAREA RUNOFF(CFS) =    0.59
  TOTAL AREA(ACRES) =        3.4   TOTAL RUNOFF(CFS) =      11.24
  TC(MIN.) =    7.03

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    118.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.03
  RAINFALL INTENSITY(INCH/HR) =   4.50
  TOTAL STREAM AREA(ACRES) =     3.37
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     11.24

****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    126.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    453.85
  DOWNSTREAM ELEVATION(FEET) =    453.20
  ELEVATION DIFFERENCE(FEET) =      0.65
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.079
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.555
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
  FLOW PROCESS FROM NODE    126.00 TO NODE    127.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  453.20  DOWNSTREAM ELEVATION(FEET) =  430.50
  STREET LENGTH(FEET) =   655.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   8.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.18
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.28
    HALFSTREET FLOOD WIDTH(FEET) =    7.67
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.66
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.02
  STREET FLOW TRAVEL TIME(MIN.) =   2.98   Tc(MIN.) =    8.06
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.125
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.750
  SUBAREA AREA(ACRES) =    3.06      SUBAREA RUNOFF(CFS) =    9.47
  TOTAL AREA(ACRES) =        3.1        PEAK FLOW RATE(CFS) =       9.74
```

```
  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =  10.16
  FLOW VELOCITY(FEET/SEC.) =  4.24   DEPTH*VELOCITY(FT*FT/SEC.) =   1.40
  LONGEST FLOWPATH FROM NODE    125.00 TO NODE    127.00 =     720.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    127.00 TO NODE    118.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.06
  RAINFALL INTENSITY(INCH/HR) =   4.12
  TOTAL STREAM AREA(ACRES) =     3.15
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.74

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       22.08     7.31        4.391          6.82
      2       11.24     7.03        4.504          3.37
      3        9.74     8.06        4.125          3.15

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       41.26     7.03       4.504
      2       41.88     7.31       4.391
      3       40.77     8.06       4.125

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      41.88   Tc(MIN.) =    7.31
  TOTAL AREA(ACRES) =       13.3
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    118.00 =    1174.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    103.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   427.00  DOWNSTREAM(FEET) =   426.00
  FLOW LENGTH(FEET) =   130.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  25.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.43
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      41.88
  PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =    7.57
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    103.00 =    1304.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    130.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       41.88     7.57       4.294       13.34
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    130.00 =    1304.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        7.71     6.64       4.674        1.92
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    130.00 =     523.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
```

```
      1      44.42       6.64        4.674
      2      48.95       7.57        4.294

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      48.95   Tc(MIN.) =    7.57
  TOTAL AREA(ACRES) =       15.3

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    128.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   426.00  DOWNSTREAM(FEET) =   422.00
  FLOW LENGTH(FEET) =   460.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  25.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.33
  ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      48.95
  PIPE TRAVEL TIME(MIN.) =   0.82    Tc(MIN.) =    8.39
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    128.00 =    1764.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    128.00 TO NODE    128.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.39
  RAINFALL INTENSITY(INCH/HR) =   4.02
  TOTAL STREAM AREA(ACRES) =    15.26
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     48.95

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    131.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    444.15
  DOWNSTREAM ELEVATION(FEET) =    443.50
  ELEVATION DIFFERENCE(FEET) =      0.65
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.079
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.555
  SUBAREA RUNOFF(CFS) =      0.42
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.42

****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    132.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   435.80  DOWNSTREAM(FEET) =   428.00
  FLOW LENGTH(FEET) =   995.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.58
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.42
  PIPE TRAVEL TIME(MIN.) =   6.43    Tc(MIN.) =   11.51
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    132.00 =    1060.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    132.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.278
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
  SUBAREA AREA(ACRES) =    6.96   SUBAREA RUNOFF(CFS) =   17.11
  TOTAL AREA(ACRES) =        7.1   TOTAL RUNOFF(CFS) =      17.36
  TC(MIN.) =   11.51

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    128.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   438.50  DOWNSTREAM(FEET) =   422.00
  FLOW LENGTH(FEET) =   115.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  20.91
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      17.36
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =   11.60
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    128.00 =    1175.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    128.00 TO NODE    128.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.60
  RAINFALL INTENSITY(INCH/HR) =   3.26
  TOTAL STREAM AREA(ACRES) =     7.06
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     17.36

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       48.95     8.39        4.018         15.26
      2       17.36    11.60        3.261          7.06

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF       Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       61.51     8.39       4.018
      2       57.08    11.60       3.261

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      61.51   Tc(MIN.) =    8.39
  TOTAL AREA(ACRES) =       22.3
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    128.00 =    1764.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    128.00 TO NODE    137.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   422.00  DOWNSTREAM(FEET) =   414.00
  FLOW LENGTH(FEET) =   610.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  25.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.50
  ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      61.51
  PIPE TRAVEL TIME(MIN.) =   0.88    Tc(MIN.) =    9.28
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    137.00 =    2374.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    137.00 TO NODE    137.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.28
  RAINFALL INTENSITY(INCH/HR) =   3.77
  TOTAL STREAM AREA(ACRES) =    22.32
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     61.51

****************************************************************************
  FLOW PROCESS FROM NODE    135.00 TO NODE    136.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   103.00
  UPSTREAM ELEVATION(FEET) =    432.50
  DOWNSTREAM ELEVATION(FEET) =    431.60
  ELEVATION DIFFERENCE(FEET) =      0.90
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.568
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    57.48
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.612
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.19
  TOTAL AREA(ACRES) =      0.25   TOTAL RUNOFF(CFS) =      1.19

****************************************************************************
  FLOW PROCESS FROM NODE    136.00 TO NODE    137.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  430.75  DOWNSTREAM ELEVATION(FEET) =  418.50
  STREET LENGTH(FEET) =  1000.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 44.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  22.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       8.12
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.36
    HALFSTREET FLOOD WIDTH(FEET) =   11.71
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.72
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.98
  STREET FLOW TRAVEL TIME(MIN.) =   6.12   Tc(MIN.) =    9.69
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.663
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL AREA RUNOFF COEFFICIENT = .8500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  SUBAREA AREA(ACRES) =    4.30      SUBAREA RUNOFF(CFS) =   13.39
  TOTAL AREA(ACRES) =        4.6        PEAK FLOW RATE(CFS) =      14.17

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.42   HALFSTREET FLOOD WIDTH(FEET) =  14.75
  FLOW VELOCITY(FEET/SEC.) =  3.09   DEPTH*VELOCITY(FT*FT/SEC.) =   1.30
  LONGEST FLOWPATH FROM NODE    135.00 TO NODE    137.00 =    1103.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    137.00 TO NODE    137.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
```

```
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.69
  RAINFALL INTENSITY(INCH/HR) =   3.66
  TOTAL STREAM AREA(ACRES) =     4.55
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     14.17

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       61.51     9.28        3.767         22.32
      2       14.17     9.69        3.663          4.55

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       75.08     9.28       3.767
      2       73.99     9.69       3.663

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      75.08   Tc(MIN.) =    9.28
  TOTAL AREA(ACRES) =       26.9
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    137.00 =    2374.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    137.00 TO NODE    138.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   412.00  DOWNSTREAM(FEET) =   411.00
  FLOW LENGTH(FEET) =    75.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  39.0 INCH PIPE IS  27.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.19
  ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      75.08
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    9.38
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    138.00 =    2449.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    138.00 TO NODE    138.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    141.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    460.00
  DOWNSTREAM ELEVATION(FEET) =    450.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.178
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.612
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.67
  TOTAL AREA(ACRES) =      0.20   TOTAL RUNOFF(CFS) =      0.67

****************************************************************************
  FLOW PROCESS FROM NODE    141.00 TO NODE    142.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   450.00  DOWNSTREAM(FEET) =   425.00
  FLOW LENGTH(FEET) =   652.00   MANNING'S N =  0.013
```

```
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.14
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.67
  PIPE TRAVEL TIME(MIN.) =   2.11    Tc(MIN.) =    6.29
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    142.00 =     752.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    141.00 TO NODE    142.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.839
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =    2.56   SUBAREA RUNOFF(CFS) =    7.43
  TOTAL AREA(ACRES) =        2.8   TOTAL RUNOFF(CFS) =       8.01
  TC(MIN.) =    6.29

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    147.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   420.00  DOWNSTREAM(FEET) =   417.00
  FLOW LENGTH(FEET) =   271.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.54
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.01
  PIPE TRAVEL TIME(MIN.) =   0.69    Tc(MIN.) =    6.98
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    147.00 =    1023.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    147.00 TO NODE    147.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.98
  RAINFALL INTENSITY(INCH/HR) =   4.52
  TOTAL STREAM AREA(ACRES) =     2.76
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.01

****************************************************************************
  FLOW PROCESS FROM NODE    145.00 TO NODE    146.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    449.15
  DOWNSTREAM ELEVATION(FEET) =    448.50
  ELEVATION DIFFERENCE(FEET) =      0.65
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.079
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.555
  SUBAREA RUNOFF(CFS) =      0.46
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.46

****************************************************************************
  FLOW PROCESS FROM NODE    146.00 TO NODE    147.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  448.50  DOWNSTREAM ELEVATION(FEET) =  421.50
  STREET LENGTH(FEET) =   614.00   CURB HEIGHT(INCHES) =  6.0
```

```
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   8.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.29
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.27
    HALFSTREET FLOOD WIDTH(FEET) =    7.31
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.05
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.10
  STREET FLOW TRAVEL TIME(MIN.) =   2.53   Tc(MIN.) =    7.60
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.282
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.750
  SUBAREA AREA(ACRES) =    2.98      SUBAREA RUNOFF(CFS) =    9.57
  TOTAL AREA(ACRES) =        3.1        PEAK FLOW RATE(CFS) =       9.92

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =   9.72
  FLOW VELOCITY(FEET/SEC.) =  4.67   DEPTH*VELOCITY(FT*FT/SEC.) =   1.50
  LONGEST FLOWPATH FROM NODE    145.00 TO NODE    147.00 =     679.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    147.00 TO NODE    147.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.60
  RAINFALL INTENSITY(INCH/HR) =   4.28
  TOTAL STREAM AREA(ACRES) =     3.09
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.92

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        8.01     6.98        4.525          2.76
      2        9.92     7.60        4.282          3.09

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       17.12     6.98       4.525
      2       17.51     7.60       4.282

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      17.51   Tc(MIN.) =    7.60
  TOTAL AREA(ACRES) =        5.8
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    147.00 =    1023.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    147.00 TO NODE    148.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   417.00  DOWNSTREAM(FEET) =   411.00
  FLOW LENGTH(FEET) =   192.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  14.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.36
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      17.51
  PIPE TRAVEL TIME(MIN.) =   0.28    Tc(MIN.) =    7.89
```

```
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    148.00 =    1215.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    148.00 TO NODE    148.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.89
  RAINFALL INTENSITY(INCH/HR) =   4.18
  TOTAL STREAM AREA(ACRES) =     5.85
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     17.51

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    151.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    453.45
  DOWNSTREAM ELEVATION(FEET) =    452.80
  ELEVATION DIFFERENCE(FEET) =      0.65
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.079
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.555
  SUBAREA RUNOFF(CFS) =      0.42
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.42

****************************************************************************
  FLOW PROCESS FROM NODE    151.00 TO NODE    152.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  452.80  DOWNSTREAM ELEVATION(FEET) =  415.80
  STREET LENGTH(FEET) =   900.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   8.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.44
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.28
    HALFSTREET FLOOD WIDTH(FEET) =    7.57
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.94
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.09
  STREET FLOW TRAVEL TIME(MIN.) =   3.81   Tc(MIN.) =    8.89
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.873
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.750
  SUBAREA AREA(ACRES) =    3.39      SUBAREA RUNOFF(CFS) =    9.85
  TOTAL AREA(ACRES) =        3.5        PEAK FLOW RATE(CFS) =      10.14

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =   9.97
  FLOW VELOCITY(FEET/SEC.) =  4.56   DEPTH*VELOCITY(FT*FT/SEC.) =   1.48
  LONGEST FLOWPATH FROM NODE    150.00 TO NODE    152.00 =     965.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    152.00 TO NODE    148.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.89
```

```
  RAINFALL INTENSITY(INCH/HR) =   3.87
  TOTAL STREAM AREA(ACRES) =     3.49
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.14

****************************************************************************
  FLOW PROCESS FROM NODE    155.00 TO NODE    156.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    430.25
  DOWNSTREAM ELEVATION(FEET) =    429.60
  ELEVATION DIFFERENCE(FEET) =      0.65
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.079
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.555
  SUBAREA RUNOFF(CFS) =      0.42
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.42

****************************************************************************
  FLOW PROCESS FROM NODE    156.00 TO NODE    157.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  429.60  DOWNSTREAM ELEVATION(FEET) =  415.80
  STREET LENGTH(FEET) =   476.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   8.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.33
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.23
    HALFSTREET FLOOD WIDTH(FEET) =    5.28
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.93
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.68
  STREET FLOW TRAVEL TIME(MIN.) =   2.71   Tc(MIN.) =    7.79
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.217
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.750
  SUBAREA AREA(ACRES) =    1.20      SUBAREA RUNOFF(CFS) =    3.80
  TOTAL AREA(ACRES) =        1.3        PEAK FLOW RATE(CFS) =       4.11

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.27   HALFSTREET FLOOD WIDTH(FEET) =   7.16
  FLOW VELOCITY(FEET/SEC.) =  3.26   DEPTH*VELOCITY(FT*FT/SEC.) =   0.88
  LONGEST FLOWPATH FROM NODE    155.00 TO NODE    157.00 =     541.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    157.00 TO NODE    148.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.79
  RAINFALL INTENSITY(INCH/HR) =   4.22
  TOTAL STREAM AREA(ACRES) =     1.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.11

  ** CONFLUENCE DATA **
```

```
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       17.51     7.89        4.183         5.85
      2       10.14     8.89        3.873         3.49
      3        4.11     7.79        4.217         1.30

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF       Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       30.36     7.79       4.217
      2       30.58     7.89       4.183
      3       30.12     8.89       3.873

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      30.58   Tc(MIN.) =    7.89
  TOTAL AREA(ACRES) =       10.6
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    148.00 =    1215.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    148.00 TO NODE    138.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   411.00  DOWNSTREAM(FEET) =   410.00
  FLOW LENGTH(FEET) =   122.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  21.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.08
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      30.58
  PIPE TRAVEL TIME(MIN.) =   0.25    Tc(MIN.) =    8.14
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    138.00 =    1337.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    138.00 TO NODE    138.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY     AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)   (ACRE)
      1       30.58     8.14        4.099       10.64
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    138.00 =    1337.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY     AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)   (ACRE)
      1       75.08     9.38        3.740       26.87
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    138.00 =    2449.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      95.73       8.14        4.099
      2     102.98       9.38        3.740

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     102.98   Tc(MIN.) =    9.38
  TOTAL AREA(ACRES) =       37.5

****************************************************************************
  FLOW PROCESS FROM NODE    138.00 TO NODE    138.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    138.00 TO NODE    162.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =   411.00  DOWNSTREAM(FEET) =   362.00
  FLOW LENGTH(FEET) =   987.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  25.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  21.36
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     102.98
  PIPE TRAVEL TIME(MIN.) =   0.77    Tc(MIN.) =   10.15
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    162.00 =    3436.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    162.00 TO NODE    162.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.15
  RAINFALL INTENSITY(INCH/HR) =   3.55
  TOTAL STREAM AREA(ACRES) =    37.51
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    102.98

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    161.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    419.00
  DOWNSTREAM ELEVATION(FEET) =    415.50
  ELEVATION DIFFERENCE(FEET) =      3.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.692
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    82.50
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.612
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.10
  TOTAL AREA(ACRES) =      0.23   TOTAL RUNOFF(CFS) =      1.10

****************************************************************************
  FLOW PROCESS FROM NODE    161.00 TO NODE    162.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  415.50  DOWNSTREAM ELEVATION(FEET) =  367.00
  STREET LENGTH(FEET) =   928.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 44.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  22.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      10.92
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.32
    HALFSTREET FLOOD WIDTH(FEET) =    9.79
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.08
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.63
  STREET FLOW TRAVEL TIME(MIN.) =   3.05   Tc(MIN.) =    5.74
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.134
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .7200
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.725
  SUBAREA AREA(ACRES) =    5.23      SUBAREA RUNOFF(CFS) =   19.33
  TOTAL AREA(ACRES) =        5.5        PEAK FLOW RATE(CFS) =      20.34

  END OF SUBAREA STREET FLOW HYDRAULICS:
```

```
  DEPTH(FEET) = 0.38   HALFSTREET FLOOD WIDTH(FEET) =  12.67
  FLOW VELOCITY(FEET/SEC.) =  5.90   DEPTH*VELOCITY(FT*FT/SEC.) =   2.24
  LONGEST FLOWPATH FROM NODE    160.00 TO NODE    162.00 =    1028.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    162.00 TO NODE    162.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.74
  RAINFALL INTENSITY(INCH/HR) =   5.13
  TOTAL STREAM AREA(ACRES) =     5.46
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     20.34

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1      102.98    10.15        3.555         37.51
      2       20.34     5.74        5.134          5.46

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       78.58     5.74       5.134
      2      117.07    10.15       3.555

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     117.07   Tc(MIN.) =   10.15
  TOTAL AREA(ACRES) =       43.0
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    162.00 =    3436.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    162.00 TO NODE    162.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    170.00 TO NODE    171.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    556.05
  DOWNSTREAM ELEVATION(FEET) =    555.40
  ELEVATION DIFFERENCE(FEET) =      0.65
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.079
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.555
  SUBAREA RUNOFF(CFS) =      0.75
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.75

****************************************************************************
  FLOW PROCESS FROM NODE    171.00 TO NODE    172.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  555.40  DOWNSTREAM ELEVATION(FEET) =  529.00
  STREET LENGTH(FEET) =   620.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   8.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020
```

```
  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.99
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.29
    HALFSTREET FLOOD WIDTH(FEET) =    8.41
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.24
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.25
  STREET FLOW TRAVEL TIME(MIN.) =   2.44   Tc(MIN.) =    7.52
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.314
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.750
  SUBAREA AREA(ACRES) =    3.82      SUBAREA RUNOFF(CFS) =   12.36
  TOTAL AREA(ACRES) =        4.0        PEAK FLOW RATE(CFS) =      12.94

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.35   HALFSTREET FLOOD WIDTH(FEET) =  10.97
  FLOW VELOCITY(FEET/SEC.) =  4.90   DEPTH*VELOCITY(FT*FT/SEC.) =   1.69
  LONGEST FLOWPATH FROM NODE    170.00 TO NODE    172.00 =     685.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    172.00 TO NODE    177.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   524.00  DOWNSTREAM(FEET) =   479.00
  FLOW LENGTH(FEET) =   483.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.52
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.94
  PIPE TRAVEL TIME(MIN.) =   0.49    Tc(MIN.) =    8.00
  LONGEST FLOWPATH FROM NODE    170.00 TO NODE    177.00 =    1168.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    177.00 TO NODE    177.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.00
  RAINFALL INTENSITY(INCH/HR) =   4.14
  TOTAL STREAM AREA(ACRES) =     4.00
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     12.94

****************************************************************************
  FLOW PROCESS FROM NODE    175.00 TO NODE    176.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    529.95
  DOWNSTREAM ELEVATION(FEET) =    529.30
  ELEVATION DIFFERENCE(FEET) =      0.65
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.079
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.555
  SUBAREA RUNOFF(CFS) =      0.67
  TOTAL AREA(ACRES) =      0.16   TOTAL RUNOFF(CFS) =      0.67

****************************************************************************
  FLOW PROCESS FROM NODE    176.00 TO NODE    177.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  529.30  DOWNSTREAM ELEVATION(FEET) =  484.00
```

```
  STREET LENGTH(FEET) =   424.70   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   8.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.22
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.24
    HALFSTREET FLOOD WIDTH(FEET) =    5.79
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.76
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.39
  STREET FLOW TRAVEL TIME(MIN.) =   1.23   Tc(MIN.) =    6.31
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.831
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.750
  SUBAREA AREA(ACRES) =    2.51      SUBAREA RUNOFF(CFS) =    9.09
  TOTAL AREA(ACRES) =        2.7        PEAK FLOW RATE(CFS) =       9.67

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.28   HALFSTREET FLOOD WIDTH(FEET) =   7.92
  FLOW VELOCITY(FEET/SEC.) =  6.48   DEPTH*VELOCITY(FT*FT/SEC.) =   1.85
  LONGEST FLOWPATH FROM NODE    175.00 TO NODE    177.00 =     489.70 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    177.00 TO NODE    177.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.31
  RAINFALL INTENSITY(INCH/HR) =   4.83
  TOTAL STREAM AREA(ACRES) =     2.67
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.67

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    181.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    643.00
  DOWNSTREAM ELEVATION(FEET) =    633.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.178
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.612
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.24
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.24

****************************************************************************
  FLOW PROCESS FROM NODE    181.00 TO NODE    182.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    633.00  DOWNSTREAM(FEET) =    500.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   857.00   CHANNEL SLOPE =  0.1552
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.24
  FLOW VELOCITY(FEET/SEC) =   2.21 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   6.47   Tc(MIN.) =   10.65
  LONGEST FLOWPATH FROM NODE    180.00 TO NODE    182.00 =     957.00 FEET.

****************************************************************************
```

```
 FLOW PROCESS FROM NODE    181.00 TO NODE    182.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.446
 *USER SPECIFIED(SUBAREA):
 VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
 SUBAREA AREA(ACRES) =    3.50   SUBAREA RUNOFF(CFS) =    7.24
 TOTAL AREA(ACRES) =        3.6   TOTAL RUNOFF(CFS) =       7.38
 TC(MIN.) =   10.65

****************************************************************************
 FLOW PROCESS FROM NODE    183.00 TO NODE    182.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.446
 *USER SPECIFIED(SUBAREA):
 VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
 SUBAREA AREA(ACRES) =    1.00   SUBAREA RUNOFF(CFS) =    2.07
 TOTAL AREA(ACRES) =        4.6   TOTAL RUNOFF(CFS) =       9.45
 TC(MIN.) =   10.65

****************************************************************************
 FLOW PROCESS FROM NODE    182.00 TO NODE    177.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   495.00  DOWNSTREAM(FEET) =   479.00
 FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  15.58
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       9.45
 PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =   10.82
 LONGEST FLOWPATH FROM NODE    180.00 TO NODE    177.00 =    1117.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    177.00 TO NODE    177.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
 TIME OF CONCENTRATION(MIN.) =   10.82
 RAINFALL INTENSITY(INCH/HR) =   3.41
 TOTAL STREAM AREA(ACRES) =     4.57
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.45

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       12.94     8.00        4.143          4.00
     2        9.67     6.31        4.831          2.67
     3        9.45    10.82        3.410          4.57

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  3 STREAMS.

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       25.38     6.31       4.831
     2       28.23     8.00       4.143
     3       26.93    10.82       3.410

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      28.23   Tc(MIN.) =    8.00
 TOTAL AREA(ACRES) =       11.2
 LONGEST FLOWPATH FROM NODE    170.00 TO NODE    177.00 =    1168.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    177.00 TO NODE    187.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   479.00  DOWNSTREAM(FEET) =   425.00
  FLOW LENGTH(FEET) =   570.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  19.69
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      28.23
  PIPE TRAVEL TIME(MIN.) =   0.48    Tc(MIN.) =    8.49
  LONGEST FLOWPATH FROM NODE    170.00 TO NODE    187.00 =    1738.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    187.00 TO NODE    187.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.49
  RAINFALL INTENSITY(INCH/HR) =   3.99
  TOTAL STREAM AREA(ACRES) =    11.24
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     28.23

****************************************************************************
  FLOW PROCESS FROM NODE    185.00 TO NODE    186.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    485.25
  DOWNSTREAM ELEVATION(FEET) =    484.60
  ELEVATION DIFFERENCE(FEET) =      0.65
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.079
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.555
  SUBAREA RUNOFF(CFS) =      0.79
  TOTAL AREA(ACRES) =      0.19   TOTAL RUNOFF(CFS) =      0.79

****************************************************************************
  FLOW PROCESS FROM NODE    186.00 TO NODE    187.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  484.60  DOWNSTREAM ELEVATION(FEET) =  430.00
  STREET LENGTH(FEET) =   524.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   8.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.22
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.24
    HALFSTREET FLOOD WIDTH(FEET) =    5.84
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.68
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.38
  STREET FLOW TRAVEL TIME(MIN.) =   1.54   Tc(MIN.) =    6.62
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.684
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
```

```
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.750
  SUBAREA AREA(ACRES) =    2.51      SUBAREA RUNOFF(CFS) =    8.82
  TOTAL AREA(ACRES) =        2.7        PEAK FLOW RATE(CFS) =       9.49

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.28   HALFSTREET FLOOD WIDTH(FEET) =   7.87
  FLOW VELOCITY(FEET/SEC.) =  6.43   DEPTH*VELOCITY(FT*FT/SEC.) =   1.82
  LONGEST FLOWPATH FROM NODE    185.00 TO NODE    187.00 =     589.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    187.00 TO NODE    187.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.62
  RAINFALL INTENSITY(INCH/HR) =   4.68
  TOTAL STREAM AREA(ACRES) =     2.70
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.49

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       28.23     8.49        3.989         11.24
      2        9.49     6.62        4.684          2.70

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       33.52     6.62       4.684
      2       36.30     8.49       3.989

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      36.30   Tc(MIN.) =    8.49
  TOTAL AREA(ACRES) =       13.9
  LONGEST FLOWPATH FROM NODE    170.00 TO NODE    187.00 =    1738.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    187.00 TO NODE    192.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   425.00  DOWNSTREAM(FEET) =   418.00
  FLOW LENGTH(FEET) =   575.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  21.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.81
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      36.30
  PIPE TRAVEL TIME(MIN.) =   0.98    Tc(MIN.) =    9.46
  LONGEST FLOWPATH FROM NODE    170.00 TO NODE    192.00 =    2313.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    192.00 TO NODE    192.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.46
  RAINFALL INTENSITY(INCH/HR) =   3.72
  TOTAL STREAM AREA(ACRES) =    13.94
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     36.30

****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    191.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    434.55
  DOWNSTREAM ELEVATION(FEET) =    433.90
  ELEVATION DIFFERENCE(FEET) =      0.65
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.079
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.555
  SUBAREA RUNOFF(CFS) =      0.33
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.33

****************************************************************************
  FLOW PROCESS FROM NODE    191.00 TO NODE    192.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  433.90  DOWNSTREAM ELEVATION(FEET) =  423.00
  STREET LENGTH(FEET) =   681.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   8.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.07
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.34
    HALFSTREET FLOOD WIDTH(FEET) =   10.47
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.91
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.98
  STREET FLOW TRAVEL TIME(MIN.) =   3.90   Tc(MIN.) =    8.98
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.847
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.750
  SUBAREA AREA(ACRES) =    4.57      SUBAREA RUNOFF(CFS) =   13.19
  TOTAL AREA(ACRES) =        4.7        PEAK FLOW RATE(CFS) =      13.42

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.40   HALFSTREET FLOOD WIDTH(FEET) =  13.66
  FLOW VELOCITY(FEET/SEC.) =  3.38   DEPTH*VELOCITY(FT*FT/SEC.) =   1.35
  LONGEST FLOWPATH FROM NODE    190.00 TO NODE    192.00 =     746.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    192.00 TO NODE    192.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.98
  RAINFALL INTENSITY(INCH/HR) =   3.85
  TOTAL STREAM AREA(ACRES) =     4.65
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     13.42

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       36.30     9.46        3.719         13.94
      2       13.42     8.98        3.847          4.65

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
```

```
     1       48.51     8.98       3.847
     2       49.27     9.46       3.719

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      49.27   Tc(MIN.) =    9.46
  TOTAL AREA(ACRES) =       18.6
  LONGEST FLOWPATH FROM NODE    170.00 TO NODE    192.00 =    2313.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    192.00 TO NODE    162.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   418.00  DOWNSTREAM(FEET) =   362.00
  FLOW LENGTH(FEET) =   539.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  23.91
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      49.27
  PIPE TRAVEL TIME(MIN.) =   0.38    Tc(MIN.) =    9.84
  LONGEST FLOWPATH FROM NODE    170.00 TO NODE    162.00 =    2852.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    162.00 TO NODE    162.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       49.27     9.84       3.626       18.59
  LONGEST FLOWPATH FROM NODE    170.00 TO NODE    162.00 =    2852.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1      117.07    10.15       3.555       42.97
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    162.00 =    3436.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1     162.77       9.84        3.626
     2     165.36      10.15        3.555

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     165.36   Tc(MIN.) =   10.15
  TOTAL AREA(ACRES) =       61.6

****************************************************************************
  FLOW PROCESS FROM NODE    162.00 TO NODE    162.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    162.00 TO NODE    197.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   362.00  DOWNSTREAM(FEET) =   315.00
  FLOW LENGTH(FEET) =   915.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  39.0 INCH PIPE IS  29.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  24.31
  ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     165.36
  PIPE TRAVEL TIME(MIN.) =   0.63    Tc(MIN.) =   10.78
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    197.00 =    4351.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    197.00 TO NODE    197.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
```

```
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.78
  RAINFALL INTENSITY(INCH/HR) =   3.42
  TOTAL STREAM AREA(ACRES) =    61.56
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    165.36

****************************************************************************
  FLOW PROCESS FROM NODE    195.00 TO NODE    196.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .7300
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    370.00
  DOWNSTREAM ELEVATION(FEET) =    360.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.092
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.612
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.52
  TOTAL AREA(ACRES) =      0.37   TOTAL RUNOFF(CFS) =      1.52

****************************************************************************
  FLOW PROCESS FROM NODE    196.00 TO NODE    197.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  360.60  DOWNSTREAM ELEVATION(FEET) =  318.50
  STREET LENGTH(FEET) =   805.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 44.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  22.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      10.61
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.32
    HALFSTREET FLOOD WIDTH(FEET) =    9.63
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.08
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.62
  STREET FLOW TRAVEL TIME(MIN.) =   2.64   Tc(MIN.) =    5.73
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.137
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .7200
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.721
  SUBAREA AREA(ACRES) =    4.90      SUBAREA RUNOFF(CFS) =   18.12
  TOTAL AREA(ACRES) =        5.3        PEAK FLOW RATE(CFS) =      19.51

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.38   HALFSTREET FLOOD WIDTH(FEET) =  12.51
  FLOW VELOCITY(FEET/SEC.) =  5.80   DEPTH*VELOCITY(FT*FT/SEC.) =   2.18
  LONGEST FLOWPATH FROM NODE    195.00 TO NODE    197.00 =     905.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    197.00 TO NODE    197.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.73
  RAINFALL INTENSITY(INCH/HR) =   5.14
  TOTAL STREAM AREA(ACRES) =     5.27
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     19.51
```

```
  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1      165.36    10.78        3.420         61.56
      2       19.51     5.73        5.137          5.27

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1      107.51     5.73       5.137
      2      178.35    10.78       3.420

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     178.35   Tc(MIN.) =   10.78
  TOTAL AREA(ACRES) =       66.8
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    197.00 =    4351.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    197.00 TO NODE    198.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   313.00  DOWNSTREAM(FEET) =   283.50
  FLOW LENGTH(FEET) =   858.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  45.0 INCH PIPE IS  31.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  21.57
  ESTIMATED PIPE DIAMETER(INCH) =  45.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     178.35
  PIPE TRAVEL TIME(MIN.) =   0.66    Tc(MIN.) =   11.44
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    198.00 =    5209.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    197.00 TO NODE    198.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.291
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (HILLY) RUNOFF COEFFICIENT = .5000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7261
  SUBAREA AREA(ACRES) =    2.15   SUBAREA RUNOFF(CFS) =    3.54
  TOTAL AREA(ACRES) =       69.0   TOTAL RUNOFF(CFS) =     178.35
  TC(MIN.) =   11.44
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE    198.00 TO NODE    198.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  22.24   RAIN INTENSITY(INCH/HOUR) =  2.14
  TOTAL AREA(ACRES) =    68.98   TOTAL RUNOFF(CFS) =     83.92

****************************************************************************
  FLOW PROCESS FROM NODE    198.00 TO NODE    304.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   278.00  DOWNSTREAM(FEET) =   200.00
  FLOW LENGTH(FEET) =  1006.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  19.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  24.38
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      83.92
  PIPE TRAVEL TIME(MIN.) =   0.69    Tc(MIN.) =   22.93
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    304.00 =    6215.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    304.00 IS CODE =   1
```

```
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   22.93
  RAINFALL INTENSITY(INCH/HR) =   2.10
  TOTAL STREAM AREA(ACRES) =    68.98
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     83.92

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    655.00
  DOWNSTREAM ELEVATION(FEET) =    645.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.178
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.612
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.11
  TOTAL AREA(ACRES) =      0.33   TOTAL RUNOFF(CFS) =      1.11

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    645.00  DOWNSTREAM(FEET) =    450.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1066.00   CHANNEL SLOPE =  0.1829
  CHANNEL FLOW THRU SUBAREA(CFS) =       1.11
  FLOW VELOCITY(FEET/SEC) =   2.48 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   7.16   Tc(MIN.) =   11.34
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =    1166.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.309
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =   18.82   SUBAREA RUNOFF(CFS) =   37.37
  TOTAL AREA(ACRES) =       19.1   TOTAL RUNOFF(CFS) =      38.02
  TC(MIN.) =   11.34

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    450.00  DOWNSTREAM(FEET) =    305.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  2180.00   CHANNEL SLOPE =  0.0665
  CHANNEL FLOW THRU SUBAREA(CFS) =      38.02
  FLOW VELOCITY(FEET/SEC) =   9.23 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   3.94   Tc(MIN.) =   15.28
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    303.00 =    3346.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.731
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
```

```
  SUBAREA AREA(ACRES) =   34.79   SUBAREA RUNOFF(CFS) =   57.00
  TOTAL AREA(ACRES) =       53.9   TOTAL RUNOFF(CFS) =      88.38
  TC(MIN.) =   15.28

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    304.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    305.00  DOWNSTREAM(FEET) =    200.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   751.00   CHANNEL SLOPE =  0.1398
  CHANNEL FLOW THRU SUBAREA(CFS) =      88.38
  FLOW VELOCITY(FEET/SEC) =   9.31 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.34   Tc(MIN.) =   16.62
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    304.00 =    4097.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    304.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.586
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =    4.88   SUBAREA RUNOFF(CFS) =    7.57
  TOTAL AREA(ACRES) =       58.8   TOTAL RUNOFF(CFS) =      91.27
  TC(MIN.) =   16.62

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    304.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   16.62
  RAINFALL INTENSITY(INCH/HR) =   2.59
  TOTAL STREAM AREA(ACRES) =    58.82
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     91.27

****************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    311.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    410.00
  DOWNSTREAM ELEVATION(FEET) =    400.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.178
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.612
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      2.16
  TOTAL AREA(ACRES) =      0.64   TOTAL RUNOFF(CFS) =      2.16

****************************************************************************
  FLOW PROCESS FROM NODE    311.00 TO NODE    312.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    400.00  DOWNSTREAM(FEET) =    264.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  2121.00   CHANNEL SLOPE =  0.0641
  CHANNEL FLOW THRU SUBAREA(CFS) =       2.16
  FLOW VELOCITY(FEET/SEC) =   4.43 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   7.99   Tc(MIN.) =   12.16
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    312.00 =    2221.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    311.00 TO NODE    312.00 IS CODE =  81
----------------------------------------------------------------------------
```

```
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.163
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =   28.42   SUBAREA RUNOFF(CFS) =   53.94
  TOTAL AREA(ACRES) =       29.1   TOTAL RUNOFF(CFS) =      55.15
  TC(MIN.) =   12.16

****************************************************************************
  FLOW PROCESS FROM NODE    312.00 TO NODE    313.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    264.00  DOWNSTREAM(FEET) =    224.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1340.00   CHANNEL SLOPE =  0.0299
  CHANNEL FLOW THRU SUBAREA(CFS) =      55.15
  FLOW VELOCITY(FEET/SEC) =   6.88 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   3.25   Tc(MIN.) =   15.41
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    313.00 =    3561.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    312.00 TO NODE    313.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.715
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =   27.10   SUBAREA RUNOFF(CFS) =   44.15
  TOTAL AREA(ACRES) =       56.2   TOTAL RUNOFF(CFS) =      91.50
  TC(MIN.) =   15.41

****************************************************************************
  FLOW PROCESS FROM NODE    313.00 TO NODE    304.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    224.00  DOWNSTREAM(FEET) =    200.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1435.00   CHANNEL SLOPE =  0.0167
  CHANNEL FLOW THRU SUBAREA(CFS) =      91.50
  FLOW VELOCITY(FEET/SEC) =   5.98 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   4.00   Tc(MIN.) =   19.41
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    304.00 =    4996.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    313.00 TO NODE    304.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
    50 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.340
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =   19.13   SUBAREA RUNOFF(CFS) =   26.86
  TOTAL AREA(ACRES) =       75.3   TOTAL RUNOFF(CFS) =     105.70
  TC(MIN.) =   19.41

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    304.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =   19.41
  RAINFALL INTENSITY(INCH/HR) =   2.34
  TOTAL STREAM AREA(ACRES) =    75.29
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    105.70

  ** CONFLUENCE DATA **
```

```
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       83.92    22.93        2.101         68.98
      2       91.27    16.62        2.586         58.82
      3      105.70    19.41        2.340         75.29

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1      242.60    16.62       2.586
      2      259.32    19.41       2.340
      3      253.02    22.93       2.101

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     259.32   Tc(MIN.) =   19.41
  TOTAL AREA(ACRES) =      203.1
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    304.00 =    6215.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =      203.1  TC(MIN.) =     19.41
  PEAK FLOW RATE(CFS)   =     259.32
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

CHAPTER 3

HYDROLOGIC ANALYSIS

3.4 – 100-Year Developed Condition AES Model Output

```
**************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2015 Advanced Engineering Software (aes)
              Ver. 22.0 Release Date: 07/01/2015  License ID 1239

                            Analysis prepared by:




 ************************* DESCRIPTION OF STUDY *************************
* Otay Ranch Village 4 South                                            *
* 100-year return interval:  Proposed Condition                         *
* DLN 0924,  W.O. 3206-0002                                             *
 ************************************************************************

  FILE NAME: R:\0924\HYD\CALCS\AES\PR100.DAT
  TIME/DATE OF STUDY: 12:45 06/22/2016
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.350
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
  2   17.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  3   20.0     12.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  4   16.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  5   26.0     18.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  6   44.0     12.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
========================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    60.00
  UPSTREAM ELEVATION(FEET) =    437.63
  DOWNSTREAM ELEVATION(FEET) =    437.02
  ELEVATION DIFFERENCE(FEET) =      0.61
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.467
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      2.16
  TOTAL AREA(ACRES) =      0.41   TOTAL RUNOFF(CFS) =      2.16

**************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  62
------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  6 USED)<<<<<
```

```
==========================================================================
  UPSTREAM ELEVATION(FEET) =  437.02  DOWNSTREAM ELEVATION(FEET) =  432.91
  STREET LENGTH(FEET) =   413.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 44.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  12.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.55
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.34
    HALFSTREET FLOOD WIDTH(FEET) =   10.47
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.29
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.77
  STREET FLOW TRAVEL TIME(MIN.) =   3.01   Tc(MIN.) =    6.48
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.240
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  SUBAREA AREA(ACRES) =    1.51      SUBAREA RUNOFF(CFS) =    6.73
  TOTAL AREA(ACRES) =        1.9        PEAK FLOW RATE(CFS) =       8.55

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.38   HALFSTREET FLOOD WIDTH(FEET) =  12.49
  FLOW VELOCITY(FEET/SEC.) =  2.55   DEPTH*VELOCITY(FT*FT/SEC.) =   0.96
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     473.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   428.00  DOWNSTREAM(FEET) =   427.00
  FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.36
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.55
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    6.58
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =     523.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    111.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    525.00
  DOWNSTREAM ELEVATION(FEET) =    515.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.178
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  31
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   515.00  DOWNSTREAM(FEET) =   451.00
  FLOW LENGTH(FEET) =   548.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   1.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.55
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.41
  PIPE TRAVEL TIME(MIN.) =   1.39    Tc(MIN.) =    5.57
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    112.00 =     648.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.774
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =    2.16   SUBAREA RUNOFF(CFS) =    7.48
  TOTAL AREA(ACRES) =        2.3   TOTAL RUNOFF(CFS) =       7.86
  TC(MIN.) =    5.57

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    117.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   446.00  DOWNSTREAM(FEET) =   435.00
  FLOW LENGTH(FEET) =   254.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.93
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.86
  PIPE TRAVEL TIME(MIN.) =   0.39    Tc(MIN.) =    5.96
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    117.00 =     902.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    117.00 TO NODE    117.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.96
  RAINFALL INTENSITY(INCH/HR) =   5.53
  TOTAL STREAM AREA(ACRES) =     2.27
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.86

****************************************************************************
  FLOW PROCESS FROM NODE    115.00 TO NODE    116.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    526.45
  DOWNSTREAM ELEVATION(FEET) =    525.80
  ELEVATION DIFFERENCE(FEET) =      0.65
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.079
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.129
  SUBAREA RUNOFF(CFS) =      1.24
  TOTAL AREA(ACRES) =      0.27   TOTAL RUNOFF(CFS) =      1.24

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    117.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
```

```
  UPSTREAM ELEVATION(FEET) =  525.80  DOWNSTREAM ELEVATION(FEET) =  438.25
  STREET LENGTH(FEET) =   721.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   8.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       9.41
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.28
    HALFSTREET FLOOD WIDTH(FEET) =    7.57
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    6.81
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.89
  STREET FLOW TRAVEL TIME(MIN.) =   1.77   Tc(MIN.) =    6.84
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.057
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.750
  SUBAREA AREA(ACRES) =    4.28      SUBAREA RUNOFF(CFS) =   16.23
  TOTAL AREA(ACRES) =        4.6        PEAK FLOW RATE(CFS) =      17.26

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =   9.97
  FLOW VELOCITY(FEET/SEC.) =  7.76   DEPTH*VELOCITY(FT*FT/SEC.) =   2.53
  LONGEST FLOWPATH FROM NODE    115.00 TO NODE    117.00 =     786.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    117.00 TO NODE    117.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.84
  RAINFALL INTENSITY(INCH/HR) =   5.06
  TOTAL STREAM AREA(ACRES) =     4.55
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     17.26

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        7.86     5.96        5.529          2.27
      2       17.26     6.84        5.057          4.55

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       22.89     5.96       5.529
      2       24.45     6.84       5.057

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      24.45   Tc(MIN.) =    6.84
  TOTAL AREA(ACRES) =        6.8
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    117.00 =     902.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    117.00 TO NODE    118.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   433.00  DOWNSTREAM(FEET) =   427.00
  FLOW LENGTH(FEET) =   272.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.18
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
```

```
  PIPE-FLOW(CFS) =      24.45
  PIPE TRAVEL TIME(MIN.) =   0.41    Tc(MIN.) =    7.25
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    118.00 =    1174.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    118.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.25
  RAINFALL INTENSITY(INCH/HR) =   4.87
  TOTAL STREAM AREA(ACRES) =     6.82
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     24.45

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    121.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    451.55
  DOWNSTREAM ELEVATION(FEET) =    450.90
  ELEVATION DIFFERENCE(FEET) =      0.65
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.079
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.129
  SUBAREA RUNOFF(CFS) =      1.43
  TOTAL AREA(ACRES) =      0.31   TOTAL RUNOFF(CFS) =      1.43

****************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  446.20  DOWNSTREAM ELEVATION(FEET) =  430.50
  STREET LENGTH(FEET) =   446.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   8.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.78
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    8.66
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.91
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.17
  STREET FLOW TRAVEL TIME(MIN.) =   1.90   Tc(MIN.) =    6.98
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.992
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.750
  SUBAREA AREA(ACRES) =    2.84      SUBAREA RUNOFF(CFS) =   10.63
  TOTAL AREA(ACRES) =        3.1        PEAK FLOW RATE(CFS) =      11.79

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.35   HALFSTREET FLOOD WIDTH(FEET) =  11.03
  FLOW VELOCITY(FEET/SEC.) =  4.42   DEPTH*VELOCITY(FT*FT/SEC.) =   1.53
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    122.00 =     511.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  81
```

```
--------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.992
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (HILLY) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7402
  SUBAREA AREA(ACRES) =    0.22   SUBAREA RUNOFF(CFS) =    0.66
  TOTAL AREA(ACRES) =        3.4   TOTAL RUNOFF(CFS) =      12.45
  TC(MIN.) =    6.98

********************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    118.00 IS CODE =   1
--------------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.98
  RAINFALL INTENSITY(INCH/HR) =   4.99
  TOTAL STREAM AREA(ACRES) =     3.37
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     12.45

********************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    126.00 IS CODE =  21
--------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
================================================================================
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    453.85
  DOWNSTREAM ELEVATION(FEET) =    453.20
  ELEVATION DIFFERENCE(FEET) =      0.65
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.079
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.129
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.41

********************************************************************************
  FLOW PROCESS FROM NODE    126.00 TO NODE    127.00 IS CODE =  61
--------------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
================================================================================
  UPSTREAM ELEVATION(FEET) =  453.20  DOWNSTREAM ELEVATION(FEET) =  430.50
  STREET LENGTH(FEET) =   655.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   8.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.74
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.29
    HALFSTREET FLOOD WIDTH(FEET) =    8.03
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.76
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.08
  STREET FLOW TRAVEL TIME(MIN.) =   2.90   Tc(MIN.) =    7.98
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.579
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.750
  SUBAREA AREA(ACRES) =    3.06      SUBAREA RUNOFF(CFS) =   10.51
  TOTAL AREA(ACRES) =        3.1        PEAK FLOW RATE(CFS) =      10.82
```

```
  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =  10.66
  FLOW VELOCITY(FEET/SEC.) =  4.31   DEPTH*VELOCITY(FT*FT/SEC.) =   1.46
  LONGEST FLOWPATH FROM NODE    125.00 TO NODE    127.00 =     720.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    127.00 TO NODE    118.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.98
  RAINFALL INTENSITY(INCH/HR) =   4.58
  TOTAL STREAM AREA(ACRES) =     3.15
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.82

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       24.45     7.25        4.872          6.82
      2       12.45     6.98        4.992          3.37
      3       10.82     7.98        4.579          3.15

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       45.78     6.98       4.992
      2       46.43     7.25       4.872
      3       45.22     7.98       4.579

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      46.43   Tc(MIN.) =    7.25
  TOTAL AREA(ACRES) =       13.3
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    118.00 =    1174.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    103.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   427.00  DOWNSTREAM(FEET) =   426.00
  FLOW LENGTH(FEET) =   130.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  25.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.79
  ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      46.43
  PIPE TRAVEL TIME(MIN.) =   0.25    Tc(MIN.) =    7.50
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    103.00 =    1304.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    130.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       46.43     7.50       4.768       13.34
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    130.00 =    1304.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        8.55     6.58       5.189        1.92
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    130.00 =     523.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
```

```
      1      49.28       6.58        5.189
      2      54.29       7.50        4.768

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      54.29   Tc(MIN.) =    7.50
  TOTAL AREA(ACRES) =       15.3

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    128.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   426.00  DOWNSTREAM(FEET) =   422.00
  FLOW LENGTH(FEET) =   460.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  27.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.47
  ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      54.29
  PIPE TRAVEL TIME(MIN.) =   0.81    Tc(MIN.) =    8.31
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    128.00 =    1764.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    128.00 TO NODE    128.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.31
  RAINFALL INTENSITY(INCH/HR) =   4.46
  TOTAL STREAM AREA(ACRES) =    15.26
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     54.29

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    131.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    444.15
  DOWNSTREAM ELEVATION(FEET) =    443.50
  ELEVATION DIFFERENCE(FEET) =      0.65
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.079
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.129
  SUBAREA RUNOFF(CFS) =      0.46
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.46

****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    132.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   435.80  DOWNSTREAM(FEET) =   428.00
  FLOW LENGTH(FEET) =   995.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.64
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.46
  PIPE TRAVEL TIME(MIN.) =   6.29    Tc(MIN.) =   11.37
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    132.00 =    1060.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    132.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.645
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7500
  SUBAREA AREA(ACRES) =    6.96   SUBAREA RUNOFF(CFS) =   19.03
  TOTAL AREA(ACRES) =        7.1   TOTAL RUNOFF(CFS) =      19.30
  TC(MIN.) =   11.37

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    128.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   438.50  DOWNSTREAM(FEET) =   422.00
  FLOW LENGTH(FEET) =   115.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   9.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  21.48
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      19.30
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =   11.46
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    128.00 =    1175.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    128.00 TO NODE    128.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.46
  RAINFALL INTENSITY(INCH/HR) =   3.63
  TOTAL STREAM AREA(ACRES) =     7.06
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     19.30

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       54.29     8.31        4.463         15.26
      2       19.30    11.46        3.627          7.06

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       68.28     8.31       4.463
      2       63.42    11.46       3.627

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      68.28   Tc(MIN.) =    8.31
  TOTAL AREA(ACRES) =       22.3
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    128.00 =    1764.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    128.00 TO NODE    137.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   422.00  DOWNSTREAM(FEET) =   414.00
  FLOW LENGTH(FEET) =   610.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  27.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.66
  ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      68.28
  PIPE TRAVEL TIME(MIN.) =   0.87    Tc(MIN.) =    9.18
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    137.00 =    2374.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    137.00 TO NODE    137.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.18
  RAINFALL INTENSITY(INCH/HR) =   4.18
  TOTAL STREAM AREA(ACRES) =    22.32
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     68.28

****************************************************************************
  FLOW PROCESS FROM NODE    135.00 TO NODE    136.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   103.00
  UPSTREAM ELEVATION(FEET) =    432.50
  DOWNSTREAM ELEVATION(FEET) =    431.60
  ELEVATION DIFFERENCE(FEET) =      0.90
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.568
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    57.48
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.32
  TOTAL AREA(ACRES) =      0.25   TOTAL RUNOFF(CFS) =      1.32

****************************************************************************
  FLOW PROCESS FROM NODE    136.00 TO NODE    137.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  430.75  DOWNSTREAM ELEVATION(FEET) =  418.50
  STREET LENGTH(FEET) =  1000.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 44.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  22.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       9.02
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.37
    HALFSTREET FLOOD WIDTH(FEET) =   12.27
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.78
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.03
  STREET FLOW TRAVEL TIME(MIN.) =   6.00   Tc(MIN.) =    9.57
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.073
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL AREA RUNOFF COEFFICIENT = .8500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  SUBAREA AREA(ACRES) =    4.30      SUBAREA RUNOFF(CFS) =   14.89
  TOTAL AREA(ACRES) =        4.6        PEAK FLOW RATE(CFS) =      15.75

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.43   HALFSTREET FLOOD WIDTH(FEET) =  15.31
  FLOW VELOCITY(FEET/SEC.) =  3.20   DEPTH*VELOCITY(FT*FT/SEC.) =   1.38
  LONGEST FLOWPATH FROM NODE    135.00 TO NODE    137.00 =    1103.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    137.00 TO NODE    137.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
```

```
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.57
  RAINFALL INTENSITY(INCH/HR) =   4.07
  TOTAL STREAM AREA(ACRES) =     4.55
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     15.75

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       68.28     9.18        4.185         22.32
      2       15.75     9.57        4.073          4.55

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       83.38     9.18       4.185
      2       82.21     9.57       4.073

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      83.38   Tc(MIN.) =    9.18
  TOTAL AREA(ACRES) =       26.9
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    137.00 =    2374.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    137.00 TO NODE    138.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   412.00  DOWNSTREAM(FEET) =   411.00
  FLOW LENGTH(FEET) =    75.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  39.0 INCH PIPE IS  29.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.37
  ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      83.38
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    9.28
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    138.00 =    2449.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    138.00 TO NODE    138.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    141.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    460.00
  DOWNSTREAM ELEVATION(FEET) =    450.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.178
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.74
  TOTAL AREA(ACRES) =      0.20   TOTAL RUNOFF(CFS) =      0.74

****************************************************************************
  FLOW PROCESS FROM NODE    141.00 TO NODE    142.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   450.00  DOWNSTREAM(FEET) =   425.00
  FLOW LENGTH(FEET) =   652.00   MANNING'S N =  0.013
```

```
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.31
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.74
  PIPE TRAVEL TIME(MIN.) =   2.05    Tc(MIN.) =    6.23
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    142.00 =     752.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    141.00 TO NODE    142.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.375
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =    2.56   SUBAREA RUNOFF(CFS) =    8.26
  TOTAL AREA(ACRES) =        2.8   TOTAL RUNOFF(CFS) =       8.90
  TC(MIN.) =    6.23

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    147.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   420.00  DOWNSTREAM(FEET) =   417.00
  FLOW LENGTH(FEET) =   271.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.66
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.90
  PIPE TRAVEL TIME(MIN.) =   0.68    Tc(MIN.) =    6.90
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    147.00 =    1023.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    147.00 TO NODE    147.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.90
  RAINFALL INTENSITY(INCH/HR) =   5.03
  TOTAL STREAM AREA(ACRES) =     2.76
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.90

****************************************************************************
  FLOW PROCESS FROM NODE    145.00 TO NODE    146.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    449.15
  DOWNSTREAM ELEVATION(FEET) =    448.50
  ELEVATION DIFFERENCE(FEET) =      0.65
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.079
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.129
  SUBAREA RUNOFF(CFS) =      0.51
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.51

****************************************************************************
  FLOW PROCESS FROM NODE    146.00 TO NODE    147.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  448.50  DOWNSTREAM ELEVATION(FEET) =  421.50
  STREET LENGTH(FEET) =   614.00   CURB HEIGHT(INCHES) =  6.0
```

```
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   8.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.86
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.28
    HALFSTREET FLOOD WIDTH(FEET) =    7.67
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.15
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.16
  STREET FLOW TRAVEL TIME(MIN.) =   2.47   Tc(MIN.) =    7.55
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.748
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.750
  SUBAREA AREA(ACRES) =    2.98      SUBAREA RUNOFF(CFS) =   10.61
  TOTAL AREA(ACRES) =        3.1        PEAK FLOW RATE(CFS) =      11.00

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =  10.22
  FLOW VELOCITY(FEET/SEC.) =  4.73   DEPTH*VELOCITY(FT*FT/SEC.) =   1.57
  LONGEST FLOWPATH FROM NODE    145.00 TO NODE    147.00 =     679.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    147.00 TO NODE    147.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.55
  RAINFALL INTENSITY(INCH/HR) =   4.75
  TOTAL STREAM AREA(ACRES) =     3.09
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     11.00

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        8.90     6.90        5.029          2.76
      2       11.00     7.55        4.748          3.09

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       18.97     6.90       5.029
      2       19.41     7.55       4.748

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      19.41   Tc(MIN.) =    7.55
  TOTAL AREA(ACRES) =        5.8
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    147.00 =    1023.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    147.00 TO NODE    148.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   417.00  DOWNSTREAM(FEET) =   411.00
  FLOW LENGTH(FEET) =   192.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.06
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      19.41
  PIPE TRAVEL TIME(MIN.) =   0.27    Tc(MIN.) =    7.81
```

```
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    148.00 =    1215.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    148.00 TO NODE    148.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.81
  RAINFALL INTENSITY(INCH/HR) =   4.64
  TOTAL STREAM AREA(ACRES) =     5.85
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     19.41

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    151.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    453.45
  DOWNSTREAM ELEVATION(FEET) =    452.80
  ELEVATION DIFFERENCE(FEET) =      0.65
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.079
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.129
  SUBAREA RUNOFF(CFS) =      0.46
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.46

****************************************************************************
  FLOW PROCESS FROM NODE    151.00 TO NODE    152.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  452.80  DOWNSTREAM ELEVATION(FEET) =  415.80
  STREET LENGTH(FEET) =   900.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   8.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.03
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.28
    HALFSTREET FLOOD WIDTH(FEET) =    7.92
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.04
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.15
  STREET FLOW TRAVEL TIME(MIN.) =   3.71   Tc(MIN.) =    8.79
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.302
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.750
  SUBAREA AREA(ACRES) =    3.39      SUBAREA RUNOFF(CFS) =   10.94
  TOTAL AREA(ACRES) =        3.5        PEAK FLOW RATE(CFS) =      11.26

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =  10.47
  FLOW VELOCITY(FEET/SEC.) =  4.64   DEPTH*VELOCITY(FT*FT/SEC.) =   1.56
  LONGEST FLOWPATH FROM NODE    150.00 TO NODE    152.00 =     965.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    152.00 TO NODE    148.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.79
```

```
  RAINFALL INTENSITY(INCH/HR) =   4.30
  TOTAL STREAM AREA(ACRES) =     3.49
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     11.26

****************************************************************************
  FLOW PROCESS FROM NODE    155.00 TO NODE    156.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    430.25
  DOWNSTREAM ELEVATION(FEET) =    429.60
  ELEVATION DIFFERENCE(FEET) =      0.65
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.079
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.129
  SUBAREA RUNOFF(CFS) =      0.46
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.46

****************************************************************************
  FLOW PROCESS FROM NODE    156.00 TO NODE    157.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  429.60  DOWNSTREAM ELEVATION(FEET) =  415.80
  STREET LENGTH(FEET) =   476.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   8.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.58
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.24
    HALFSTREET FLOOD WIDTH(FEET) =    5.64
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.96
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.71
  STREET FLOW TRAVEL TIME(MIN.) =   2.68   Tc(MIN.) =    7.76
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.662
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.750
  SUBAREA AREA(ACRES) =    1.20      SUBAREA RUNOFF(CFS) =    4.20
  TOTAL AREA(ACRES) =        1.3        PEAK FLOW RATE(CFS) =       4.55

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.28   HALFSTREET FLOOD WIDTH(FEET) =   7.52
  FLOW VELOCITY(FEET/SEC.) =  3.33   DEPTH*VELOCITY(FT*FT/SEC.) =   0.92
  LONGEST FLOWPATH FROM NODE    155.00 TO NODE    157.00 =     541.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    157.00 TO NODE    148.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.76
  RAINFALL INTENSITY(INCH/HR) =   4.66
  TOTAL STREAM AREA(ACRES) =     1.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.55

  ** CONFLUENCE DATA **
```

```
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       19.41     7.81        4.644         5.85
      2       11.26     8.79        4.302         3.49
      3        4.55     7.76        4.662         1.30

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF       Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       33.82     7.76       4.662
      2       33.94     7.81       4.644
      3       33.44     8.79       4.302

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      33.94   Tc(MIN.) =    7.81
  TOTAL AREA(ACRES) =       10.6
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    148.00 =    1215.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    148.00 TO NODE    138.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   411.00  DOWNSTREAM(FEET) =   410.00
  FLOW LENGTH(FEET) =   122.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  23.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.17
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      33.94
  PIPE TRAVEL TIME(MIN.) =   0.25    Tc(MIN.) =    8.06
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    138.00 =    1337.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    138.00 TO NODE    138.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY     AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)   (ACRE)
      1       33.94     8.06        4.551       10.64
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    138.00 =    1337.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY     AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)   (ACRE)
      1       83.38     9.28        4.155       26.87
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    138.00 =    2449.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1     106.36       8.06        4.551
      2     114.38       9.28        4.155

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     114.38   Tc(MIN.) =    9.28
  TOTAL AREA(ACRES) =       37.5

****************************************************************************
  FLOW PROCESS FROM NODE    138.00 TO NODE    138.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    138.00 TO NODE    162.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =   411.00  DOWNSTREAM(FEET) =   362.00
  FLOW LENGTH(FEET) =   987.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  24.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  22.21
  ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     114.38
  PIPE TRAVEL TIME(MIN.) =   0.74    Tc(MIN.) =   10.02
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    162.00 =    3436.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    162.00 TO NODE    162.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.02
  RAINFALL INTENSITY(INCH/HR) =   3.95
  TOTAL STREAM AREA(ACRES) =    37.51
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    114.38

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    161.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .8500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    419.00
  DOWNSTREAM ELEVATION(FEET) =    415.50
  ELEVATION DIFFERENCE(FEET) =      3.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.692
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    82.50
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.21
  TOTAL AREA(ACRES) =      0.23   TOTAL RUNOFF(CFS) =      1.21

****************************************************************************
  FLOW PROCESS FROM NODE    161.00 TO NODE    162.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  415.50  DOWNSTREAM ELEVATION(FEET) =  367.00
  STREET LENGTH(FEET) =   928.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 44.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  22.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      12.12
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.33
    HALFSTREET FLOOD WIDTH(FEET) =   10.27
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.17
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.71
  STREET FLOW TRAVEL TIME(MIN.) =   2.99   Tc(MIN.) =    5.68
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.700
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .7200
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.725
  SUBAREA AREA(ACRES) =    5.23      SUBAREA RUNOFF(CFS) =   21.46
  TOTAL AREA(ACRES) =        5.5        PEAK FLOW RATE(CFS) =      22.58

  END OF SUBAREA STREET FLOW HYDRAULICS:
```

```
  DEPTH(FEET) = 0.39   HALFSTREET FLOOD WIDTH(FEET) =  13.23
  FLOW VELOCITY(FEET/SEC.) =  6.04   DEPTH*VELOCITY(FT*FT/SEC.) =   2.36
  LONGEST FLOWPATH FROM NODE    160.00 TO NODE    162.00 =    1028.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    162.00 TO NODE    162.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.68
  RAINFALL INTENSITY(INCH/HR) =   5.70
  TOTAL STREAM AREA(ACRES) =     5.46
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     22.58

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1      114.38    10.02        3.955         37.51
      2       22.58     5.68        5.700          5.46

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       87.47     5.68       5.700
      2      130.04    10.02       3.955

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     130.04   Tc(MIN.) =   10.02
  TOTAL AREA(ACRES) =       43.0
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    162.00 =    3436.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    162.00 TO NODE    162.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    170.00 TO NODE    171.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    556.05
  DOWNSTREAM ELEVATION(FEET) =    555.40
  ELEVATION DIFFERENCE(FEET) =      0.65
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.079
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.129
  SUBAREA RUNOFF(CFS) =      0.83
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.83

****************************************************************************
  FLOW PROCESS FROM NODE    171.00 TO NODE    172.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  555.40  DOWNSTREAM ELEVATION(FEET) =  529.00
  STREET LENGTH(FEET) =   620.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   8.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020
```

```
  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.75
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    8.78
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.36
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.32
  STREET FLOW TRAVEL TIME(MIN.) =   2.37   Tc(MIN.) =    7.45
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.787
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.750
  SUBAREA AREA(ACRES) =    3.82      SUBAREA RUNOFF(CFS) =   13.72
  TOTAL AREA(ACRES) =        4.0        PEAK FLOW RATE(CFS) =      14.36

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  11.47
  FLOW VELOCITY(FEET/SEC.) =  5.01   DEPTH*VELOCITY(FT*FT/SEC.) =   1.78
  LONGEST FLOWPATH FROM NODE    170.00 TO NODE    172.00 =     685.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    172.00 TO NODE    177.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   524.00  DOWNSTREAM(FEET) =   479.00
  FLOW LENGTH(FEET) =   483.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.96
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      14.36
  PIPE TRAVEL TIME(MIN.) =   0.47    Tc(MIN.) =    7.92
  LONGEST FLOWPATH FROM NODE    170.00 TO NODE    177.00 =    1168.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    177.00 TO NODE    177.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.92
  RAINFALL INTENSITY(INCH/HR) =   4.60
  TOTAL STREAM AREA(ACRES) =     4.00
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     14.36

****************************************************************************
  FLOW PROCESS FROM NODE    175.00 TO NODE    176.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    529.95
  DOWNSTREAM ELEVATION(FEET) =    529.30
  ELEVATION DIFFERENCE(FEET) =      0.65
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.079
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.129
  SUBAREA RUNOFF(CFS) =      0.74
  TOTAL AREA(ACRES) =      0.16   TOTAL RUNOFF(CFS) =      0.74

****************************************************************************
  FLOW PROCESS FROM NODE    176.00 TO NODE    177.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  529.30  DOWNSTREAM ELEVATION(FEET) =  484.00
```

```
  STREET LENGTH(FEET) =   424.70   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   8.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.78
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.25
    HALFSTREET FLOOD WIDTH(FEET) =    6.15
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.83
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.45
  STREET FLOW TRAVEL TIME(MIN.) =   1.21   Tc(MIN.) =    6.29
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.337
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.750
  SUBAREA AREA(ACRES) =    2.51      SUBAREA RUNOFF(CFS) =   10.05
  TOTAL AREA(ACRES) =        2.7        PEAK FLOW RATE(CFS) =      10.69

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   8.28
  FLOW VELOCITY(FEET/SEC.) =  6.65   DEPTH*VELOCITY(FT*FT/SEC.) =   1.94
  LONGEST FLOWPATH FROM NODE    175.00 TO NODE    177.00 =     489.70 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    177.00 TO NODE    177.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.29
  RAINFALL INTENSITY(INCH/HR) =   5.34
  TOTAL STREAM AREA(ACRES) =     2.67
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.69

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    181.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    643.00
  DOWNSTREAM ELEVATION(FEET) =    633.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.178
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.26
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.26

****************************************************************************
  FLOW PROCESS FROM NODE    181.00 TO NODE    182.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    633.00  DOWNSTREAM(FEET) =    500.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   857.00   CHANNEL SLOPE =  0.1552
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.26
  FLOW VELOCITY(FEET/SEC) =   2.21 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   6.47   Tc(MIN.) =   10.65
  LONGEST FLOWPATH FROM NODE    180.00 TO NODE    182.00 =     957.00 FEET.

****************************************************************************
```

```
 FLOW PROCESS FROM NODE    181.00 TO NODE    182.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.801
 *USER SPECIFIED(SUBAREA):
 VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
 SUBAREA AREA(ACRES) =    3.50   SUBAREA RUNOFF(CFS) =    7.98
 TOTAL AREA(ACRES) =        3.6   TOTAL RUNOFF(CFS) =       8.14
 TC(MIN.) =   10.65

****************************************************************************
 FLOW PROCESS FROM NODE    183.00 TO NODE    182.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.801
 *USER SPECIFIED(SUBAREA):
 VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
 SUBAREA AREA(ACRES) =    1.00   SUBAREA RUNOFF(CFS) =    2.28
 TOTAL AREA(ACRES) =        4.6   TOTAL RUNOFF(CFS) =      10.42
 TC(MIN.) =   10.65

****************************************************************************
 FLOW PROCESS FROM NODE    182.00 TO NODE    177.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   495.00  DOWNSTREAM(FEET) =   479.00
 FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  16.01
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      10.42
 PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =   10.82
 LONGEST FLOWPATH FROM NODE    180.00 TO NODE    177.00 =    1117.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    177.00 TO NODE    177.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
 TIME OF CONCENTRATION(MIN.) =   10.82
 RAINFALL INTENSITY(INCH/HR) =   3.76
 TOTAL STREAM AREA(ACRES) =     4.57
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.42

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       14.36     7.92        4.600          4.00
     2       10.69     6.29        5.337          2.67
     3       10.42    10.82        3.764          4.57

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  3 STREAMS.

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       28.16     6.29       5.337
     2       31.21     7.92       4.600
     3       29.71    10.82       3.764

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      31.21   Tc(MIN.) =    7.92
 TOTAL AREA(ACRES) =       11.2
 LONGEST FLOWPATH FROM NODE    170.00 TO NODE    177.00 =    1168.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    177.00 TO NODE    187.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   479.00  DOWNSTREAM(FEET) =   425.00
  FLOW LENGTH(FEET) =   570.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  12.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  20.65
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      31.21
  PIPE TRAVEL TIME(MIN.) =   0.46    Tc(MIN.) =    8.38
  LONGEST FLOWPATH FROM NODE    170.00 TO NODE    187.00 =    1738.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    187.00 TO NODE    187.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.38
  RAINFALL INTENSITY(INCH/HR) =   4.44
  TOTAL STREAM AREA(ACRES) =    11.24
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     31.21

****************************************************************************
  FLOW PROCESS FROM NODE    185.00 TO NODE    186.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    485.25
  DOWNSTREAM ELEVATION(FEET) =    484.60
  ELEVATION DIFFERENCE(FEET) =      0.65
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.079
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.129
  SUBAREA RUNOFF(CFS) =      0.87
  TOTAL AREA(ACRES) =      0.19   TOTAL RUNOFF(CFS) =      0.87

****************************************************************************
  FLOW PROCESS FROM NODE    186.00 TO NODE    187.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  484.60  DOWNSTREAM ELEVATION(FEET) =  430.00
  STREET LENGTH(FEET) =   524.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   8.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.78
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.25
    HALFSTREET FLOOD WIDTH(FEET) =    6.15
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.82
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.45
  STREET FLOW TRAVEL TIME(MIN.) =   1.50   Tc(MIN.) =    6.58
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.187
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
```

```
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.750
  SUBAREA AREA(ACRES) =    2.51      SUBAREA RUNOFF(CFS) =    9.76
  TOTAL AREA(ACRES) =        2.7        PEAK FLOW RATE(CFS) =      10.50

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   8.28
  FLOW VELOCITY(FEET/SEC.) =  6.53   DEPTH*VELOCITY(FT*FT/SEC.) =   1.91
  LONGEST FLOWPATH FROM NODE    185.00 TO NODE    187.00 =     589.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    187.00 TO NODE    187.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.58
  RAINFALL INTENSITY(INCH/HR) =   5.19
  TOTAL STREAM AREA(ACRES) =     2.70
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.50

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       31.21     8.38        4.436         11.24
      2       10.50     6.58        5.187          2.70

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       37.19     6.58       5.187
      2       40.19     8.38       4.436

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      40.19   Tc(MIN.) =    8.38
  TOTAL AREA(ACRES) =       13.9
  LONGEST FLOWPATH FROM NODE    170.00 TO NODE    187.00 =    1738.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    187.00 TO NODE    192.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   425.00  DOWNSTREAM(FEET) =   418.00
  FLOW LENGTH(FEET) =   575.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  23.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.94
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      40.19
  PIPE TRAVEL TIME(MIN.) =   0.96    Tc(MIN.) =    9.35
  LONGEST FLOWPATH FROM NODE    170.00 TO NODE    192.00 =    2313.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    192.00 TO NODE    192.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.35
  RAINFALL INTENSITY(INCH/HR) =   4.14
  TOTAL STREAM AREA(ACRES) =    13.94
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     40.19

****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    191.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =    434.55
  DOWNSTREAM ELEVATION(FEET) =    433.90
  ELEVATION DIFFERENCE(FEET) =      0.65
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.079
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.129
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
  FLOW PROCESS FROM NODE    191.00 TO NODE    192.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  433.90  DOWNSTREAM ELEVATION(FEET) =  423.00
  STREET LENGTH(FEET) =   681.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   8.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.84
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.35
    HALFSTREET FLOOD WIDTH(FEET) =   10.97
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.97
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.03
  STREET FLOW TRAVEL TIME(MIN.) =   3.82   Tc(MIN.) =    8.90
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.268
  *USER SPECIFIED(SUBAREA):
  DENSE RESIDENTIAL (R2,R3) RUNOFF COEFFICIENT = .7500
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.750
  SUBAREA AREA(ACRES) =    4.57      SUBAREA RUNOFF(CFS) =   14.63
  TOTAL AREA(ACRES) =        4.7        PEAK FLOW RATE(CFS) =      14.88

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.41   HALFSTREET FLOOD WIDTH(FEET) =  14.22
  FLOW VELOCITY(FEET/SEC.) =  3.48   DEPTH*VELOCITY(FT*FT/SEC.) =   1.43
  LONGEST FLOWPATH FROM NODE    190.00 TO NODE    192.00 =     746.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    192.00 TO NODE    192.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.90
  RAINFALL INTENSITY(INCH/HR) =   4.27
  TOTAL STREAM AREA(ACRES) =     4.65
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     14.88

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       40.19     9.35        4.135         13.94
      2       14.88     8.90        4.268          4.65

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
```

```
     1       53.83     8.90       4.268
     2       54.61     9.35       4.135

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      54.61   Tc(MIN.) =    9.35
  TOTAL AREA(ACRES) =       18.6
  LONGEST FLOWPATH FROM NODE    170.00 TO NODE    192.00 =    2313.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    192.00 TO NODE    162.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   418.00  DOWNSTREAM(FEET) =   362.00
  FLOW LENGTH(FEET) =   539.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  16.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  24.40
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      54.61
  PIPE TRAVEL TIME(MIN.) =   0.37    Tc(MIN.) =    9.72
  LONGEST FLOWPATH FROM NODE    170.00 TO NODE    162.00 =    2852.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    162.00 TO NODE    162.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       54.61     9.72       4.034       18.59
  LONGEST FLOWPATH FROM NODE    170.00 TO NODE    162.00 =    2852.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1      130.04    10.02       3.955       42.97
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    162.00 =    3436.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1     180.73       9.72        4.034
     2     183.59      10.02        3.955

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     183.59   Tc(MIN.) =   10.02
  TOTAL AREA(ACRES) =       61.6

****************************************************************************
  FLOW PROCESS FROM NODE    162.00 TO NODE    162.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    162.00 TO NODE    197.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   362.00  DOWNSTREAM(FEET) =   315.00
  FLOW LENGTH(FEET) =   915.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  42.0 INCH PIPE IS  29.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  25.23
  ESTIMATED PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     183.59
  PIPE TRAVEL TIME(MIN.) =   0.60    Tc(MIN.) =   10.62
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    197.00 =    4351.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    197.00 TO NODE    197.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
```

```
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.62
  RAINFALL INTENSITY(INCH/HR) =   3.81
  TOTAL STREAM AREA(ACRES) =    61.56
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    183.59

****************************************************************************
  FLOW PROCESS FROM NODE    195.00 TO NODE    196.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .7300
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    370.00
  DOWNSTREAM ELEVATION(FEET) =    360.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.092
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.67
  TOTAL AREA(ACRES) =      0.37   TOTAL RUNOFF(CFS) =      1.67

****************************************************************************
  FLOW PROCESS FROM NODE    196.00 TO NODE    197.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  360.60  DOWNSTREAM ELEVATION(FEET) =  318.50
  STREET LENGTH(FEET) =   805.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 44.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  22.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      11.79
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.33
    HALFSTREET FLOOD WIDTH(FEET) =   10.11
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.17
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.70
  STREET FLOW TRAVEL TIME(MIN.) =   2.59   Tc(MIN.) =    5.69
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.699
  *USER SPECIFIED(SUBAREA):
  PAVED SURFACE RUNOFF COEFFICIENT = .7200
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.721
  SUBAREA AREA(ACRES) =    4.90      SUBAREA RUNOFF(CFS) =   20.11
  TOTAL AREA(ACRES) =        5.3        PEAK FLOW RATE(CFS) =      21.64

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.39   HALFSTREET FLOOD WIDTH(FEET) =  12.99
  FLOW VELOCITY(FEET/SEC.) =  5.99   DEPTH*VELOCITY(FT*FT/SEC.) =   2.31
  LONGEST FLOWPATH FROM NODE    195.00 TO NODE    197.00 =     905.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    197.00 TO NODE    197.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.69
  RAINFALL INTENSITY(INCH/HR) =   5.70
  TOTAL STREAM AREA(ACRES) =     5.27
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     21.64
```

```
  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1      183.59    10.62        3.808         61.56
      2       21.64     5.69        5.699          5.27

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1      119.90     5.69       5.699
      2      198.05    10.62       3.808

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     198.05   Tc(MIN.) =   10.62
  TOTAL AREA(ACRES) =       66.8
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    197.00 =    4351.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    197.00 TO NODE    198.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   313.00  DOWNSTREAM(FEET) =   283.50
  FLOW LENGTH(FEET) =   858.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  45.0 INCH PIPE IS  34.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  21.88
  ESTIMATED PIPE DIAMETER(INCH) =  45.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     198.05
  PIPE TRAVEL TIME(MIN.) =   0.65    Tc(MIN.) =   11.28
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    198.00 =    5209.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    197.00 TO NODE    198.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.664
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (HILLY) RUNOFF COEFFICIENT = .5000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7261
  SUBAREA AREA(ACRES) =    2.15   SUBAREA RUNOFF(CFS) =    3.94
  TOTAL AREA(ACRES) =       69.0   TOTAL RUNOFF(CFS) =     198.05
  TC(MIN.) =   11.28
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE    198.00 TO NODE    198.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  22.24   RAIN INTENSITY(INCH/HOUR) =  2.36
  TOTAL AREA(ACRES) =    68.98   TOTAL RUNOFF(CFS) =     98.81

****************************************************************************
  FLOW PROCESS FROM NODE    198.00 TO NODE    304.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   278.00  DOWNSTREAM(FEET) =   200.00
  FLOW LENGTH(FEET) =  1006.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  22.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  25.02
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      98.81
  PIPE TRAVEL TIME(MIN.) =   0.67    Tc(MIN.) =   22.91
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    304.00 =    6215.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    304.00 IS CODE =   1
```

```
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   22.91
  RAINFALL INTENSITY(INCH/HR) =   2.32
  TOTAL STREAM AREA(ACRES) =    68.98
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     98.81

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    655.00
  DOWNSTREAM ELEVATION(FEET) =    645.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.178
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.23
  TOTAL AREA(ACRES) =      0.33   TOTAL RUNOFF(CFS) =      1.23

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    645.00  DOWNSTREAM(FEET) =    450.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1066.00   CHANNEL SLOPE =  0.1829
  CHANNEL FLOW THRU SUBAREA(CFS) =       1.23
  FLOW VELOCITY(FEET/SEC) =   2.56 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   6.93   Tc(MIN.) =   11.11
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =    1166.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.700
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =   18.82   SUBAREA RUNOFF(CFS) =   41.78
  TOTAL AREA(ACRES) =       19.1   TOTAL RUNOFF(CFS) =      42.51
  TC(MIN.) =   11.11

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    450.00  DOWNSTREAM(FEET) =    305.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  2180.00   CHANNEL SLOPE =  0.0665
  CHANNEL FLOW THRU SUBAREA(CFS) =      42.51
  FLOW VELOCITY(FEET/SEC) =   9.53 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   3.81   Tc(MIN.) =   14.92
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    303.00 =    3346.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.059
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
```

```
  SUBAREA AREA(ACRES) =   34.79   SUBAREA RUNOFF(CFS) =   63.84
  TOTAL AREA(ACRES) =       53.9   TOTAL RUNOFF(CFS) =      98.99
  TC(MIN.) =   14.92

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    304.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    305.00  DOWNSTREAM(FEET) =    200.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   751.00   CHANNEL SLOPE =  0.1398
  CHANNEL FLOW THRU SUBAREA(CFS) =      98.99
  FLOW VELOCITY(FEET/SEC) =   9.67 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.29   Tc(MIN.) =   16.22
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    304.00 =    4097.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    304.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.899
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =    4.88   SUBAREA RUNOFF(CFS) =    8.49
  TOTAL AREA(ACRES) =       58.8   TOTAL RUNOFF(CFS) =     102.30
  TC(MIN.) =   16.22

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    304.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   16.22
  RAINFALL INTENSITY(INCH/HR) =   2.90
  TOTAL STREAM AREA(ACRES) =    58.82
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    102.30

****************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    311.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    410.00
  DOWNSTREAM ELEVATION(FEET) =    400.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.178
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      2.38
  TOTAL AREA(ACRES) =      0.64   TOTAL RUNOFF(CFS) =      2.38

****************************************************************************
  FLOW PROCESS FROM NODE    311.00 TO NODE    312.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    400.00  DOWNSTREAM(FEET) =    264.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  2121.00   CHANNEL SLOPE =  0.0641
  CHANNEL FLOW THRU SUBAREA(CFS) =       2.38
  FLOW VELOCITY(FEET/SEC) =   4.52 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   7.82   Tc(MIN.) =   12.00
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    312.00 =    2221.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    311.00 TO NODE    312.00 IS CODE =  81
----------------------------------------------------------------------------
```

```
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.521
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =   28.42   SUBAREA RUNOFF(CFS) =   60.03
  TOTAL AREA(ACRES) =       29.1   TOTAL RUNOFF(CFS) =      61.39
  TC(MIN.) =   12.00

****************************************************************************
  FLOW PROCESS FROM NODE    312.00 TO NODE    313.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    264.00  DOWNSTREAM(FEET) =    224.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1340.00   CHANNEL SLOPE =  0.0299
  CHANNEL FLOW THRU SUBAREA(CFS) =      61.39
  FLOW VELOCITY(FEET/SEC) =   7.10 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   3.15   Tc(MIN.) =   15.14
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    313.00 =    3561.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    312.00 TO NODE    313.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.030
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =   27.10   SUBAREA RUNOFF(CFS) =   49.26
  TOTAL AREA(ACRES) =       56.2   TOTAL RUNOFF(CFS) =     102.08
  TC(MIN.) =   15.14

****************************************************************************
  FLOW PROCESS FROM NODE    313.00 TO NODE    304.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    224.00  DOWNSTREAM(FEET) =    200.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1435.00   CHANNEL SLOPE =  0.0167
  CHANNEL FLOW THRU SUBAREA(CFS) =     102.08
  FLOW VELOCITY(FEET/SEC) =   6.18 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   3.87   Tc(MIN.) =   19.02
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    304.00 =    4996.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    313.00 TO NODE    304.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.616
  *USER SPECIFIED(SUBAREA):
  VEGETATED SLOPES (STEEP) RUNOFF COEFFICIENT = .6000
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6000
  SUBAREA AREA(ACRES) =   19.13   SUBAREA RUNOFF(CFS) =   30.02
  TOTAL AREA(ACRES) =       75.3   TOTAL RUNOFF(CFS) =     118.16
  TC(MIN.) =   19.02

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    304.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =   19.02
  RAINFALL INTENSITY(INCH/HR) =   2.62
  TOTAL STREAM AREA(ACRES) =    75.29
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    118.16

  ** CONFLUENCE DATA **
```

```
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       98.81    22.91        2.320         68.98
      2      102.30    16.22        2.899         58.82
      3      118.16    19.02        2.616         75.29

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1      273.01    16.22       2.899
      2      292.50    19.02       2.616
      3      285.46    22.91       2.320

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     292.50   Tc(MIN.) =   19.02
  TOTAL AREA(ACRES) =      203.1
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    304.00 =    6215.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =      203.1  TC(MIN.) =     19.02
  PEAK FLOW RATE(CFS)   =     292.50
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

CHAPTER 4

DETENTION BASIN ANALYSIS

Basin – Stage Information

Stage – Storage

Stage- Discharge

Stage -Area

Depth	Area (sf)
0	29865
1	32381
2	34956
3	37590
4	40282
5	43034
6	45844
7	48715
8	51343

Basin #1 Discharge

Discharge vs Elevation Table

Low orifice:	4.5 "	Top orifice:	8 "		
Number:	3	Number:	0		
Cg-low:	0.61	Cg-low:	0.61		
invert elev:	0.50 ft	invert elev:	0.00 ft		
Middle orifice:	3 "	Emergency inlet:			
number of orif:	0	Rim height:	5.25 ft		
Cg-middle:	0.61	Area	16.00 sq ft	<--- 4' x 4'	
invert elev:	3.50 ft	Circumference	16.00 ft		

h (ft)	H/D-low -	H/D-mid -	H/D-top -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qtop-orif (cfs)	Qtop-weir (cfs)	Qtot-top (cfs)	Qemerg (cfs)	Qtot (cfs)
0.0	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.1	0.00	0.00	0.15	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.2	0.00	0.00	0.30	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.3	0.00	0.00	0.45	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.4	0.00	0.00	0.60	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.5	0.00	0.00	0.75	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.6	0.27	0.00	0.90	0.000	0.060	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.060
0.7	0.53	0.00	1.05	0.181	0.223	0.223	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.223
0.8	0.80	0.00	1.20	0.544	0.462	0.462	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.462
0.9	1.07	0.00	1.35	0.748	0.744	0.744	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.744
1.0	1.33	0.00	1.50	0.907	1.035	0.907	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.907
1.1	1.60	0.00	1.65	1.042	1.305	1.042	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.042
1.2	1.87	0.00	1.80	1.161	1.528	1.161	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.161
1.3	2.13	0.00	1.95	1.269	1.687	1.269	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.269
1.4	2.40	0.00	2.10	1.369	1.778	1.369	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.369
1.5	2.67	0.00	2.25	1.462	1.812	1.462	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.462
1.6	2.93	0.00	2.40	1.549	1.820	1.549	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.549
1.7	3.20	0.00	2.55	1.632	1.855	1.632	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.632
1.8	3.47	0.00	2.70	1.711	1.994	1.711	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.711
1.9	3.73	0.00	2.85	1.786	2.346	1.786	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.786
2.0	4.00	0.00	3.00	1.858	3.050	1.858	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.858
2.1	4.27	0.00	3.15	1.928	4.282	1.928	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.928
2.2	4.53	0.00	3.30	1.995	6.257	1.995	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.995
2.3	4.80	0.00	3.45	2.060	9.231	2.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.060
2.4	5.07	0.00	3.60	2.123	13.508	2.123	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.123
2.5	5.33	0.00	3.75	2.184	19.439	2.184	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.184
2.6	5.60	0.00	3.90	2.243	27.430	2.243	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.243
2.7	5.87	0.00	4.05	2.301	37.940	2.301	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.301
2.8	6.13	0.00	4.20	2.357	51.490	2.357	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.357
2.9	6.40	0.00	4.35	2.413	68.660	2.413	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.413
3.0	6.67	0.00	4.50	2.467	90.099	2.467	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.467
3.1	6.93	0.00	4.65	2.519	116.525	2.519	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.519
3.2	7.20	0.00	4.80	2.571	148.726	2.571	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.571
3.3	7.47	0.00	4.95	2.622	187.568	2.622	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.622
3.4	7.73	0.00	5.10	2.671	233.997	2.671	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.671
3.5	8.00	0.00	5.25	2.720	289.039	2.720	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.720
3.6	8.27	0.40	5.40	2.768	353.808	2.768	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.768
3.7	8.53	0.80	5.55	2.815	429.507	2.815	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.815
3.8	8.80	1.20	5.70	2.862	517.431	2.862	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.862
3.9	9.07	1.60	5.85	2.907	618.972	2.907	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.907
4.0	9.33	2.00	6.00	2.952	735.619	2.952	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.952
4.1	9.60	2.40	6.15	2.996	868.966	2.996	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.996
4.2	9.87	2.80	6.30	3.040	1020.713	3.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.040
4.3	10.13	3.20	6.45	3.083	1192.669	3.083	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.083
4.4	10.40	3.60	6.60	3.125	1386.754	3.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.125
4.5	10.67	4.00	6.75	3.167	1605.007	3.167	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.167
4.6	10.93	4.40	6.90	3.208	1849.584	3.208	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.208
4.7	11.20	4.80	7.05	3.249	2122.766	3.249	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.249
4.8	11.47	5.20	7.20	3.289	2426.957	3.289	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.289
4.9	11.73	5.60	7.35	3.329	2764.694	3.329	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.329
5.0	12.00	6.00	7.50	3.368	3138.644	3.368	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.368
5.1	12.27	6.40	7.65	3.407	3551.611	3.407	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.407
5.2	12.53	6.80	7.80	3.446	4006.540	3.446	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.446
5.3	12.80	7.20	7.95	3.483	4506.518	3.483	0.000	0.000	0.000	0.000	0.000	0.000	0.555	4.038
5.4	13.07	7.60	8.10	3.521	5054.776	3.521	0.000	0.000	0.000	0.000	0.000	0.000	2.881	6.403
5.5	13.33	8.00	8.25	3.558	5654.697	3.558	0.000	0.000	0.000	0.000	0.000	0.000	6.200	9.758
5.6	13.60	8.40	8.40	3.595	6309.817	3.595	0.000	0.000	0.000	0.000	0.000	0.000	10.270	13.865
5.7	13.87	8.80	8.55	3.631	7023.827	3.631	0.000	0.000	0.000	0.000	0.000	0.000	14.973	18.604
5.8	14.13	9.20	8.70	3.667	7800.578	3.667	0.000	0.000	0.000	0.000	0.000	0.000	20.231	23.899
5.9	14.40	9.60	8.85	3.703	8644.084	3.703	0.000	0.000	0.000	0.000	0.000	0.000	25.993	29.696
6.0	14.67	10.00	9.00	3.738	9558.525	3.738	0.000	0.000	0.000	0.000	0.000	0.000	32.216	35.955
6.1	14.93	10.40	9.15	3.774	########	3.774	0.000	0.000	0.000	0.000	0.000	0.000	38.870	42.643

6.2	15.20	10.80	9.30	3.808	########	3.808	0.000	0.000	0.000	0.000	0.000	0.000	45.927	49.735
6.3	15.47	11.20	9.45	3.843	########	3.843	0.000	0.000	0.000	0.000	0.000	0.000	53.366	57.209
6.4	15.73	11.60	9.60	3.877	########	3.877	0.000	0.000	0.000	0.000	0.000	0.000	61.169	65.045
6.5	16.00	12.00	9.75	3.910	########	3.910	0.000	0.000	0.000	0.000	0.000	0.000	69.318	73.229
6.6	16.27	12.40	9.90	3.944	########	3.944	0.000	0.000	0.000	0.000	0.000	0.000	77.800	81.744
6.7	16.53	12.80	10.05	3.977	########	3.977	0.000	0.000	0.000	0.000	0.000	0.000	86.603	90.580
6.8	16.80	13.20	10.20	4.010	########	4.010	0.000	0.000	0.000	0.000	0.000	0.000	95.715	99.725
6.9	17.07	13.60	10.35	4.043	########	4.043	0.000	0.000	0.000	0.000	0.000	0.000	100.609	104.651
7.0	17.33	14.00	10.50	4.075	########	4.075	0.000	0.000	0.000	0.000	0.000	0.000	103.612	107.688
7.1	17.60	14.40	10.65	4.107	########	4.107	0.000	0.000	0.000	0.000	0.000	0.000	106.532	110.639
7.2	17.87	14.80	10.80	4.139	########	4.139	0.000	0.000	0.000	0.000	0.000	0.000	109.373	113.512
7.3	18.13	15.20	10.95	4.171	########	4.171	0.000	0.000	0.000	0.000	0.000	0.000	112.142	116.313
7.4	18.40	15.60	11.10	4.202	########	4.202	0.000	0.000	0.000	0.000	0.000	0.000	114.845	119.047
7.5	18.67	16.00	11.25	4.234	########	4.234	0.000	0.000	0.000	0.000	0.000	0.000	117.485	121.719
7.6	18.93	16.40	11.40	4.264	########	4.264	0.000	0.000	0.000	0.000	0.000	0.000	120.068	124.332
7.7	19.20	16.80	11.55	4.295	########	4.295	0.000	0.000	0.000	0.000	0.000	0.000	122.596	126.891
7.8	19.47	17.20	11.70	4.326	########	4.326	0.000	0.000	0.000	0.000	0.000	0.000	125.073	129.399
7.9	19.73	17.60	11.85	4.356	########	4.356	0.000	0.000	0.000	0.000	0.000	0.000	127.502	131.858
8.0	20.00	18.00	12.00	4.386	########	4.386	0.000	0.000	0.000	0.000	0.000	0.000	129.885	134.271

50 YEAR DETENTION

RATIONAL METHOD HYDROGRAPH PROGRAM

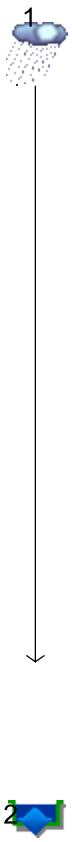
RUN DATE 6/22/2016
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 11 MIN.
6 HOUR RAINFALL 2.13 INCHES
BASIN AREA 68.98 ACRES
RUNOFF COEFFICIENT 0.78
PEAK DISCHARGE 178.35 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 11	DISCHARGE (CFS) = 6.8
TIME (MIN) = 22	DISCHARGE (CFS) = 7
TIME (MIN) = 33	DISCHARGE (CFS) = 7.3
TIME (MIN) = 44	DISCHARGE (CFS) = 7.4
TIME (MIN) = 55	DISCHARGE (CFS) = 7.8
TIME (MIN) = 66	DISCHARGE (CFS) = 8
TIME (MIN) = 77	DISCHARGE (CFS) = 8.4
TIME (MIN) = 88	DISCHARGE (CFS) = 8.7
TIME (MIN) = 99	DISCHARGE (CFS) = 9.2
TIME (MIN) = 110	DISCHARGE (CFS) = 9.5
TIME (MIN) = 121	DISCHARGE (CFS) = 10.2
TIME (MIN) = 132	DISCHARGE (CFS) = 10.6
TIME (MIN) = 143	DISCHARGE (CFS) = 11.5
TIME (MIN) = 154	DISCHARGE (CFS) = 12
TIME (MIN) = 165	DISCHARGE (CFS) = 13.3
TIME (MIN) = 176	DISCHARGE (CFS) = 14.2
TIME (MIN) = 187	DISCHARGE (CFS) = 16.2
TIME (MIN) = 198	DISCHARGE (CFS) = 17.6
TIME (MIN) = 209	DISCHARGE (CFS) = 21.5
TIME (MIN) = 220	DISCHARGE (CFS) = 24.5
TIME (MIN) = 231	DISCHARGE (CFS) = 36
TIME (MIN) = 242	DISCHARGE (CFS) = 53.9
TIME (MIN) = 253	DISCHARGE (CFS) = 178.35
TIME (MIN) = 264	DISCHARGE (CFS) = 28.8
TIME (MIN) = 275	DISCHARGE (CFS) = 19.3
TIME (MIN) = 286	DISCHARGE (CFS) = 15.1
TIME (MIN) = 297	DISCHARGE (CFS) = 12.6
TIME (MIN) = 308	DISCHARGE (CFS) = 11
TIME (MIN) = 319	DISCHARGE (CFS) = 9.8
TIME (MIN) = 330	DISCHARGE (CFS) = 8.9
TIME (MIN) = 341	DISCHARGE (CFS) = 8.2
TIME (MIN) = 352	DISCHARGE (CFS) = 7.6
TIME (MIN) = 363	DISCHARGE (CFS) = 7.1
TIME (MIN) = 374	DISCHARGE (CFS) = 0

Hydraflow Table of Contents

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3



Legend

Hyd.	Origin	Description
1	Manual	Village 4
2	Reservoir	<no description>

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

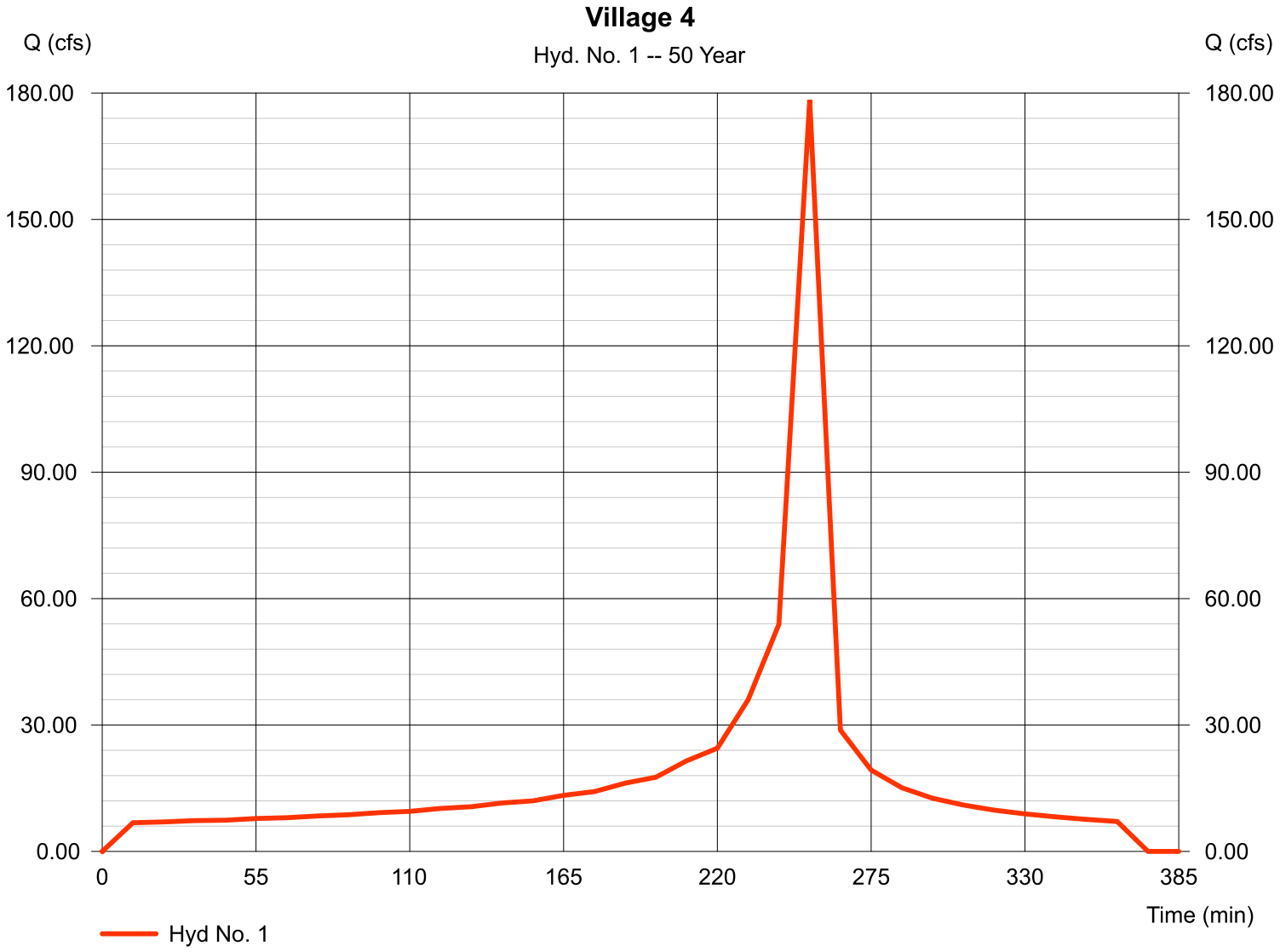
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Manual	178.35	11	253	414,711	------	------	------	Village 4
2	Reservoir	83.92	11	264	414,676	1	289.03	256,500	<no description>

Hydrograph Report

Hyd. No. 1

Village 4

Hydrograph type	= Manual	Peak discharge	= 178.35 cfs
Storm frequency	= 50 yrs	Time to peak	= 253 min
Time interval	= 11 min	Hyd. volume	= 414,711 cuft



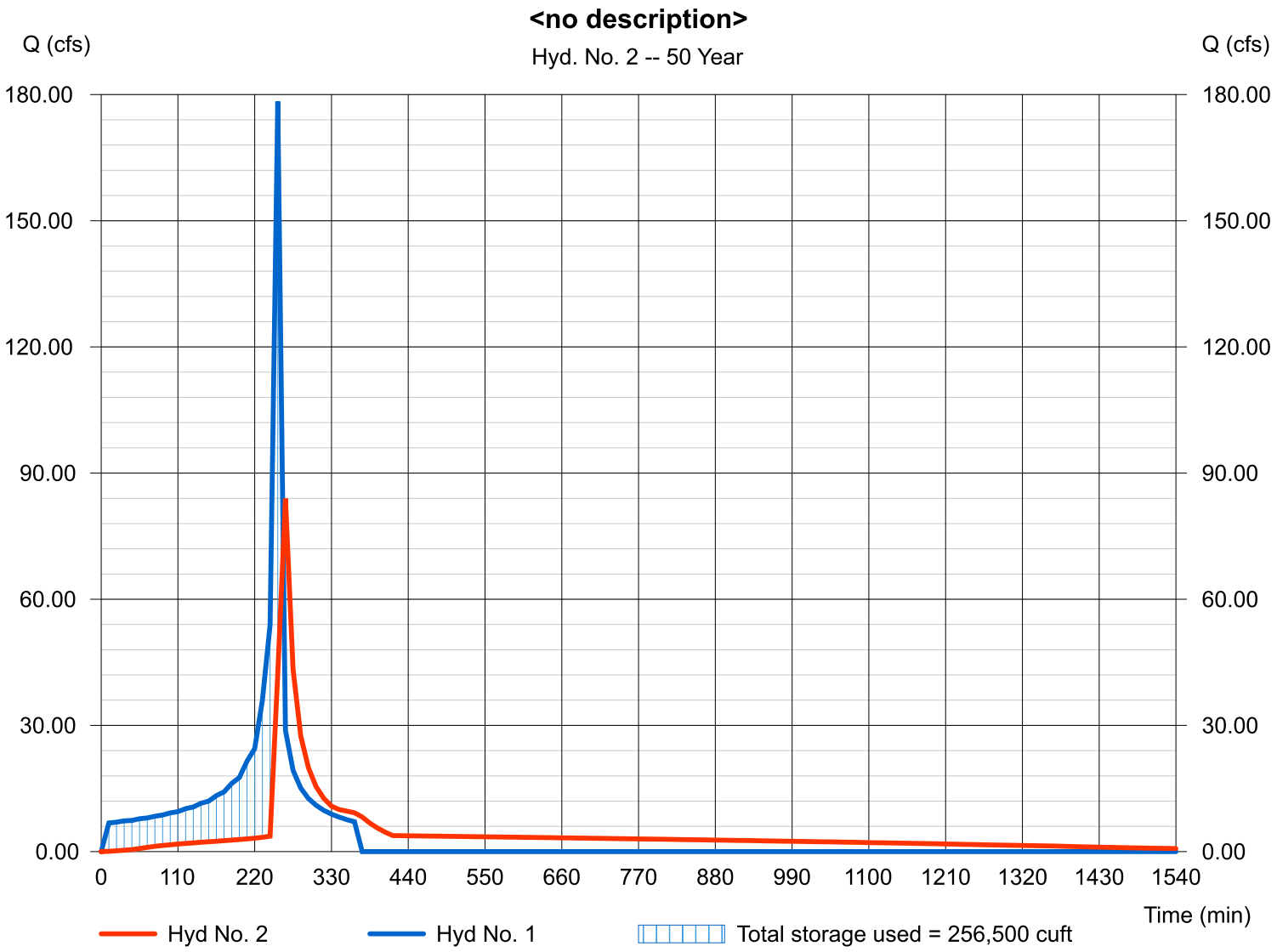
Hydrograph Report

Hyd. No. 2

<no description>

Hydrograph type	=	Reservoir	Peak discharge	=	83.92 cfs
Storm frequency	=	50 yrs	Time to peak	=	264 min
Time interval	=	11 min	Hyd. volume	=	414,676 cuft
Inflow hyd. No.	=	1 - Village 4	Max. Elevation	=	289.03 ft
Reservoir name	=	BASIN 1	Max. Storage	=	256,500 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - BASIN 1

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 282.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	282.00	29,865	0	0
0.50	282.50	31,116	15,245	15,245
1.00	283.00	32,381	15,874	31,120
1.50	283.50	33,661	16,511	47,630
2.00	284.00	34,956	17,154	64,784
2.50	284.50	36,265	17,805	82,590
3.00	285.00	37,589	18,464	101,053
3.50	285.50	38,928	19,129	120,182
4.00	286.00	40,282	19,803	139,985
4.50	286.50	41,651	20,483	160,468
5.00	287.00	43,034	21,171	181,639
5.50	287.50	44,432	21,867	203,506
6.00	288.00	45,844	22,569	226,075
6.50	288.50	47,272	23,279	249,354
7.00	289.00	48,715	23,997	273,351
7.50	289.50	50,172	24,722	298,072
8.00	290.00	51,643	25,454	323,526

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	282.00	---	---	---	---	---	---	---	---	---	---	0.000
0.50	15,245	282.50	---	---	---	---	---	---	---	---	---	0.432	0.432
1.00	31,120	283.00	---	---	---	---	---	---	---	---	---	1.338	1.338
1.50	47,630	283.50	---	---	---	---	---	---	---	---	---	1.894	1.894
2.00	64,784	284.00	---	---	---	---	---	---	---	---	---	2.290	2.290
2.50	82,590	284.50	---	---	---	---	---	---	---	---	---	2.615	2.615
3.00	101,053	285.00	---	---	---	---	---	---	---	---	---	2.898	2.898
3.50	120,182	285.50	---	---	---	---	---	---	---	---	---	3.152	3.152
4.00	139,985	286.00	---	---	---	---	---	---	---	---	---	3.384	3.384
4.50	160,468	286.50	---	---	---	---	---	---	---	---	---	3.599	3.599
5.00	181,639	287.00	---	---	---	---	---	---	---	---	---	3.800	3.800
5.50	203,506	287.50	---	---	---	---	---	---	---	---	---	10.19	10.19
6.00	226,075	288.00	---	---	---	---	---	---	---	---	---	36.39	36.39
6.50	249,354	288.50	---	---	---	---	---	---	---	---	---	73.66	73.66
7.00	273,351	289.00	---	---	---	---	---	---	---	---	---	108.12	108.12
7.50	298,072	289.50	---	---	---	---	---	---	---	---	---	122.15	122.15
8.00	323,526	290.00	---	---	---	---	---	---	---	---	---	134.70	134.70

100 YEAR DETENTION

RATIONAL METHOD HYDROGRAPH PROGRAM

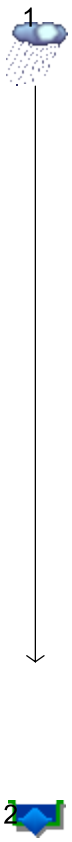
RUN DATE 6/22/2016
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 11 MIN.
6 HOUR RAINFALL 2.35 INCHES
BASIN AREA 68.98 ACRES
RUNOFF COEFFICIENT 0.78
PEAK DISCHARGE 198.05 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 11	DISCHARGE (CFS) = 7.5
TIME (MIN) = 22	DISCHARGE (CFS) = 7.7
TIME (MIN) = 33	DISCHARGE (CFS) = 8
TIME (MIN) = 44	DISCHARGE (CFS) = 8.2
TIME (MIN) = 55	DISCHARGE (CFS) = 8.6
TIME (MIN) = 66	DISCHARGE (CFS) = 8.8
TIME (MIN) = 77	DISCHARGE (CFS) = 9.3
TIME (MIN) = 88	DISCHARGE (CFS) = 9.5
TIME (MIN) = 99	DISCHARGE (CFS) = 10.1
TIME (MIN) = 110	DISCHARGE (CFS) = 10.5
TIME (MIN) = 121	DISCHARGE (CFS) = 11.2
TIME (MIN) = 132	DISCHARGE (CFS) = 11.7
TIME (MIN) = 143	DISCHARGE (CFS) = 12.7
TIME (MIN) = 154	DISCHARGE (CFS) = 13.3
TIME (MIN) = 165	DISCHARGE (CFS) = 14.7
TIME (MIN) = 176	DISCHARGE (CFS) = 15.6
TIME (MIN) = 187	DISCHARGE (CFS) = 17.9
TIME (MIN) = 198	DISCHARGE (CFS) = 19.4
TIME (MIN) = 209	DISCHARGE (CFS) = 23.7
TIME (MIN) = 220	DISCHARGE (CFS) = 27
TIME (MIN) = 231	DISCHARGE (CFS) = 39.7
TIME (MIN) = 242	DISCHARGE (CFS) = 58.2
TIME (MIN) = 253	DISCHARGE (CFS) = 198.05
TIME (MIN) = 264	DISCHARGE (CFS) = 31.8
TIME (MIN) = 275	DISCHARGE (CFS) = 21.3
TIME (MIN) = 286	DISCHARGE (CFS) = 16.7
TIME (MIN) = 297	DISCHARGE (CFS) = 14
TIME (MIN) = 308	DISCHARGE (CFS) = 12.1
TIME (MIN) = 319	DISCHARGE (CFS) = 10.8
TIME (MIN) = 330	DISCHARGE (CFS) = 9.8
TIME (MIN) = 341	DISCHARGE (CFS) = 9
TIME (MIN) = 352	DISCHARGE (CFS) = 8.4
TIME (MIN) = 363	DISCHARGE (CFS) = 7.8
TIME (MIN) = 374	DISCHARGE (CFS) = 0

Hydraflow Table of Contents

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3



Legend

Hyd.	Origin	Description
1	Manual	Village 4
2	Reservoir	<no description>

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Manual	198.05	11	253	457,413	------	------	------	Village 4
2	Reservoir	98.71	11	264	457,378	1	289.31	266,796	<no description>

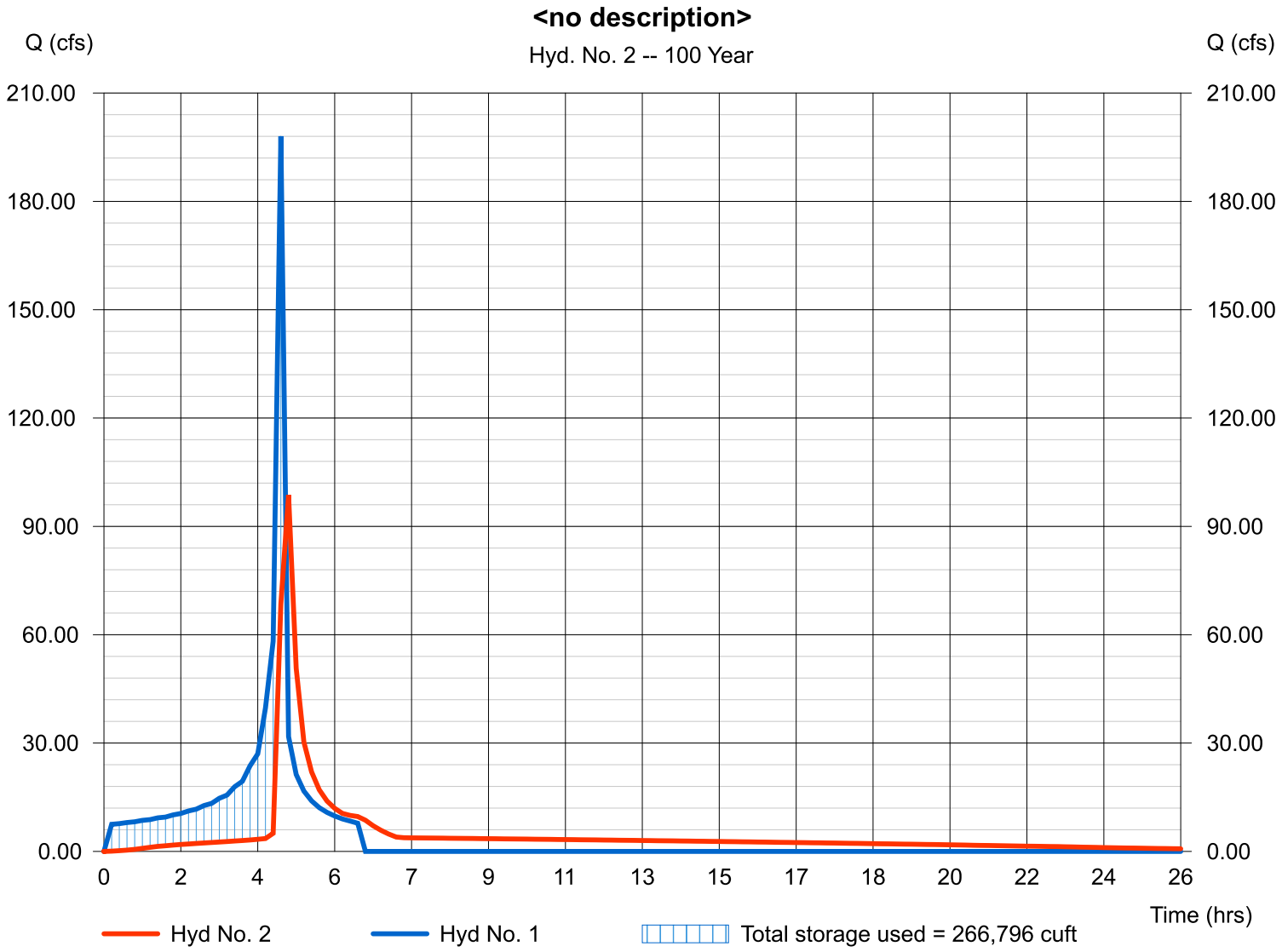
Hydrograph Report

Hyd. No. 2

<no description>

Hydrograph type	=	Reservoir	Peak discharge	=	98.71 cfs
Storm frequency	=	100 yrs	Time to peak	=	4.40 hrs
Time interval	=	11 min	Hyd. volume	=	457,378 cuft
Inflow hyd. No.	=	1 - Village 4	Max. Elevation	=	289.31 ft
Reservoir name	=	BASIN 1	Max. Storage	=	266,796 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - BASIN 1

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 282.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	282.00	29,865	0	0
0.50	282.50	31,116	15,245	15,245
1.00	283.00	32,381	15,874	31,120
1.50	283.50	33,661	16,511	47,630
2.00	284.00	34,956	17,154	64,784
2.50	284.50	36,265	17,805	82,590
3.00	285.00	37,589	18,464	101,053
3.50	285.50	38,928	19,129	120,182
4.00	286.00	40,282	19,803	139,985
4.50	286.50	41,651	20,483	160,468
5.00	287.00	43,034	21,171	181,639
5.50	287.50	44,432	21,867	203,506
6.00	288.00	45,844	22,569	226,075
6.50	288.50	47,272	23,279	249,354
7.00	289.00	48,715	23,997	273,351
7.50	289.50	50,172	24,722	298,072
8.00	290.00	51,643	25,454	323,526

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

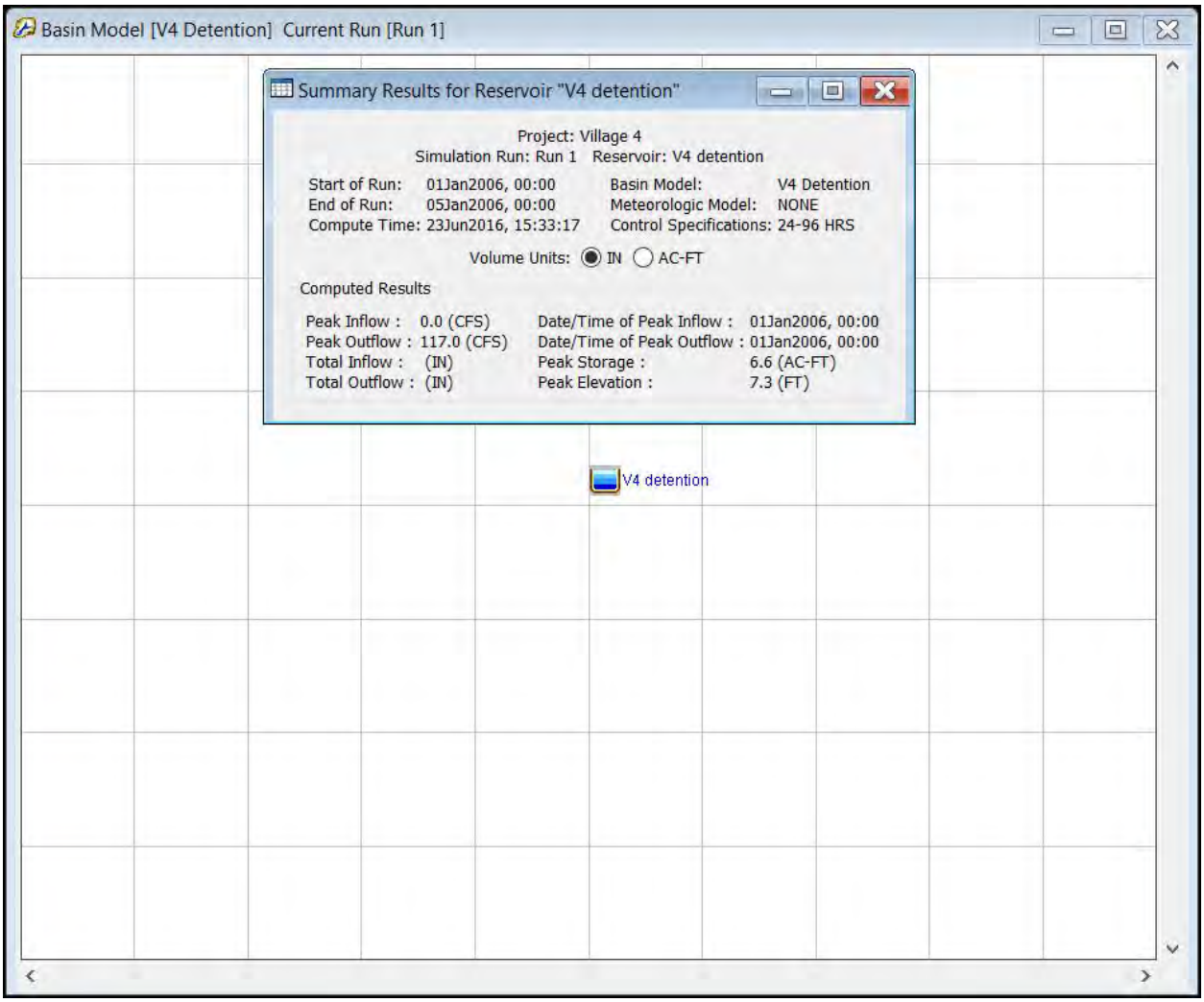
Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

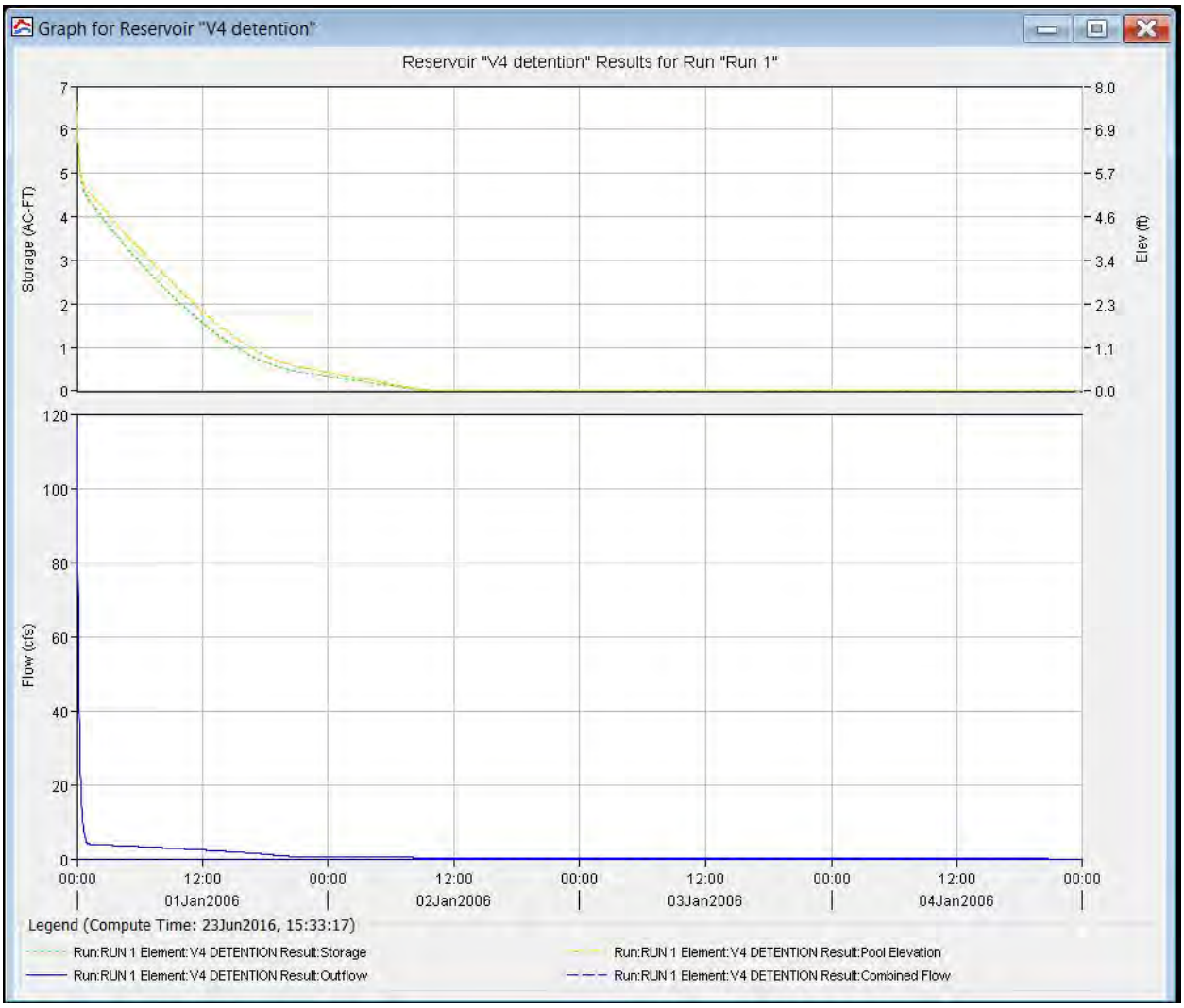
Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	282.00	---	---	---	---	---	---	---	---	---	---	0.000
0.50	15,245	282.50	---	---	---	---	---	---	---	---	---	0.432	0.432
1.00	31,120	283.00	---	---	---	---	---	---	---	---	---	1.338	1.338
1.50	47,630	283.50	---	---	---	---	---	---	---	---	---	1.894	1.894
2.00	64,784	284.00	---	---	---	---	---	---	---	---	---	2.290	2.290
2.50	82,590	284.50	---	---	---	---	---	---	---	---	---	2.615	2.615
3.00	101,053	285.00	---	---	---	---	---	---	---	---	---	2.898	2.898
3.50	120,182	285.50	---	---	---	---	---	---	---	---	---	3.152	3.152
4.00	139,985	286.00	---	---	---	---	---	---	---	---	---	3.384	3.384
4.50	160,468	286.50	---	---	---	---	---	---	---	---	---	3.599	3.599
5.00	181,639	287.00	---	---	---	---	---	---	---	---	---	3.800	3.800
5.50	203,506	287.50	---	---	---	---	---	---	---	---	---	10.19	10.19
6.00	226,075	288.00	---	---	---	---	---	---	---	---	---	36.39	36.39
6.50	249,354	288.50	---	---	---	---	---	---	---	---	---	73.66	73.66
7.00	273,351	289.00	---	---	---	---	---	---	---	---	---	108.12	108.12
7.50	298,072	289.50	---	---	---	---	---	---	---	---	---	122.15	122.15
8.00	323,526	290.00	---	---	---	---	---	---	---	---	---	134.70	134.70

BASIN DRAWDOWN CALCULTIONS

Village 4 Basin Drawdown Calculations using HEC HMS



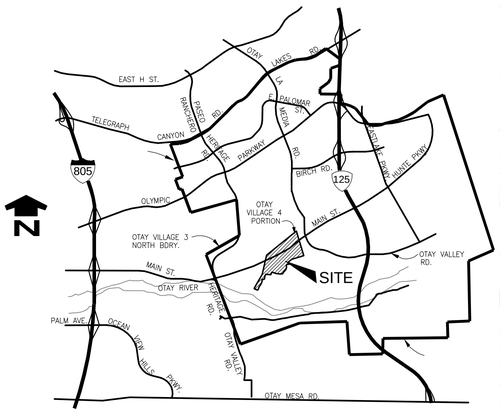

Graph for Reservoir "V4 detention"
Reservoir "V4 detention" Results for Run "Run 1"
Storage (AC-FT)
Elev (ft)
Flow (cfs)
00:00
12:00
01Jan2006
02Jan2006
03Jan2006
04Jan2006
Legend (Compute Time: 23Jun2016, 15:33:17)
Run:RUN 1 Element:V4 DETENTION Result:Storage
Run:RUN 1 Element:V4 DETENTION Result:Pool Elevation
Run:RUN 1 Element:V4 DETENTION Result:Outflow
Run:RUN 1 Element:V4 DETENTION Result:Combined Flow

CHAPTER 5

EXHIBIT 1
PRE-DEVELOPED CONDITION
HYDROLOGY MAP

EXHIBIT 2
DEVELOPED CONDITION
HYDROLOGY MAP

EXHIBIT 3
OVERLAY OF FLOOD INSURANCE RATE MAP



VICINITY MAP

NOT TO SCALE

WOLF CANYON

WOLF CANYON TRIBUTARY

PROJECT BOUNDARY

WOLF CANYON

VILLAGE 8 WEST

29.34 ACRES

19.29 ACRES

9.97 ACRES

18.96 ACRES

14.79 ACRES

17.23 ACRES

7.06 ACRES

0.11 ACRES

0.12 ACRES

22.68 ACRES

25.58 ACRES

18.69 ACRES

0.59 ACRES

0.47 ACRES

PROJECT BOUNDARY

PROJECT BOUNDARY

EXISTING CONDITION
AREA = 201.4 ACRES
Q50 = 266.21 CFS
Q100 = 295.29 CFS

LEGEND

- PROJECT BOUNDARY
- DRAINAGE BOUNDARY
- INITIAL SUBAREA
- FLOW DIRECTION
- NODE # (#)
- SUBAREA ACREAGE (29.34 ACRES)

0 150 300 450

SCALE 1" = 150'

PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC

PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 · FX(858)558-1414

EXHIBIT 1
EXISTING CONDITION
HYDROLOGY MAP

OTAY RANCH
PORTIN OF VILLAGE 4

CITY OF CHULA VISTA, CALIFORNIA

MAP 1 OF 2

W.O.# 3205-0002

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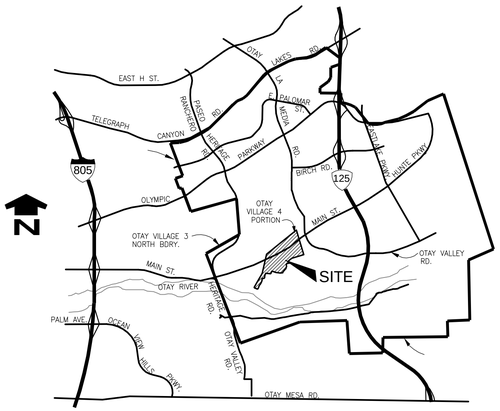

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VICINITY MAP

NOT TO SCALE

WOLF CANYON

WOLF CANYON TRIBUTARY

WOLF CANYON

PROJECT BOUNDARY

VILLAGE 8 WEST WATER QUALITY BASIN

VILLAGE 8 WEST

MAIN STREET

MAIN STREET BRIDGE

FUTURE BRIDGE TO DRAIN WEST ALONG MAIN ST. PER TENTATIVE MAP DRAINAGE STUDY FOR VILLAGE 3 NORTH AND A PORTION OF VILLAGE 4.

STORM DRAIN OUTLET
PROPOSED CONDITION
AREA = 68.98 ACRES
Q50 = 83.66 CFS

EXISTING CONDITION
AREA = 201.4 ACRES
Q50 = 266.21 CFS
Q100 = 295.29 CFS

PROPOSED CONDITION
AREA = 203.09 ACRES
Q50 = 259.32 CFS
Q100 = 292.50 CFS

VILLAGE 4 SOUTH WATER QUALITY BASIN

BOTTOM AREA = 29,865 SF
BOTTOM ELEV = 282.00'
TOP ELEV.= 290.00'

PROJECT BOUNDARY

PROJECT BOUNDARY

OTAY RIVER

LEGEND

- PROJECT BOUNDARY
- DRAINAGE BOUNDARY
- INITIAL SUBAREA
- FLOW DIRECTION
- NODE # (#)
- SUBAREA ACREAGE (29.34 ACRES)

0 200 400 600

SCALE 1" = 200'

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EXHIBIT 2
DEVELOPED CONDITION
HYDROLOGY MAP

OTAY RANCH PORTION OF VILLAGE 4

CITY OF CHULA VISTA, CALIFORNIA

MAP 2 OF 3

W.O.# 3205-0002

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VICINITY MAP

NOT TO SCALE

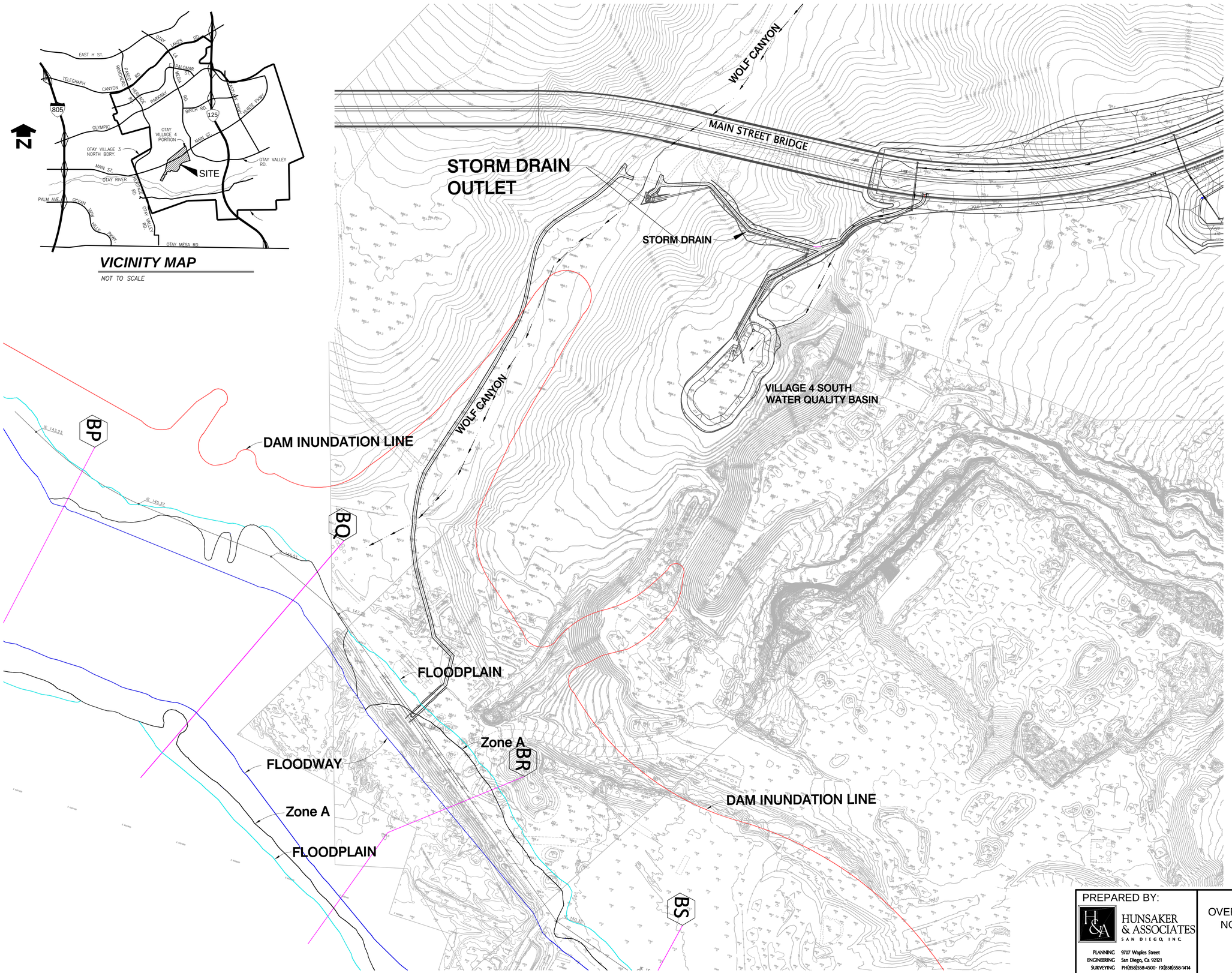

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EXHIBIT 3
OVERLAY OF FLOOD INSURANCE RATE MAP
NOS. 06073C2178G AND 060732C2176G

OTAY RANCH VILLAGE 4 SOUTH

CITY OF CHULA VISTA, CALIFORNIA

MAP 3 OF 3

W.O.# 3206-0002

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