PRELIMINARY DRAINAGE STUDY

For:

Shinohara Business Center

517 Shinohara Lane
Chula Vista, CA 91911

APN: 644-040-01
Project Permit # DR21-0032

Prepared By:

5-20-2022

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Prepared for:

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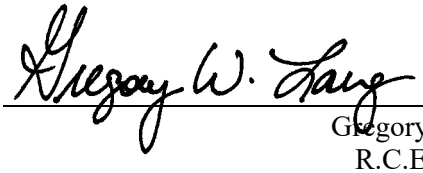
May 20, 2022

PLSA Job No. 3690

DECLARATION OF RESPONSIBLE CHARGE

I, hereby declare that I am the Engineer of Work for this project. That I have exercised responsible charge over the design of the project as defined in section 6703 of the business and professions code, and that the design is consistent with current standards.

I understand that the check of project drawings and specifications by the County of San Diego is confined to a review only and does not relieve me, as engineer of work, of my responsibilities for project design.



Gregory W. Lang
R.C.E. 68075
EXP. 6-30-23

05/20/2022
DATE

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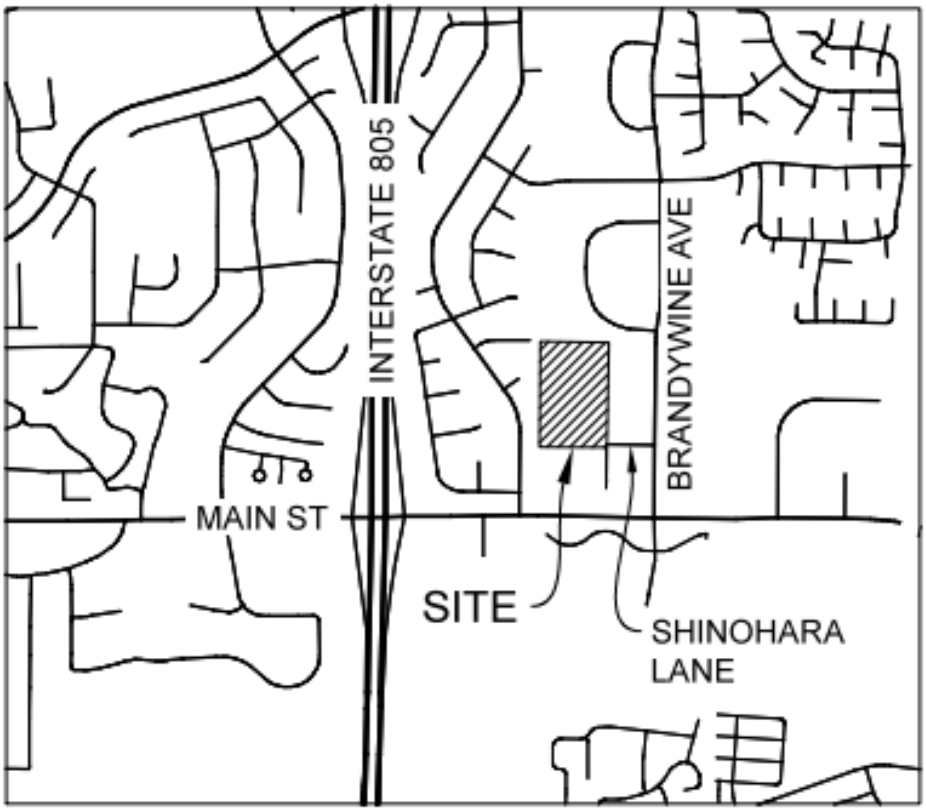


VICINITY MAP

NOT TO SCALE

1. INTRODUCTION

This Preliminary Drainage Study for the proposed Project Shinohara has been prepared to analyze the hydrologic characteristics of the existing and proposed project site. This report presents both the methodology and the calculations used for determining the storm water runoff from the project site in the existing and proposed conditions produced by the 100-year, 6-hour storm event.

1.1 Project Description

The 9.73-acre project site consists of undeveloped land located northwest of the intersection of Brandywine Avenue and Shinohara Lane, at the end of Shinohara Lane in the City of Chula Vista, San Diego County, California. The property is defined as a portion of Lot 1, Section 19, Township 18 South, Range 1 West, San Bernadino Meridian, and identified by the Assessor's Parcel Number (APN) 644-040-01.

The existing site is currently undeveloped except for minor concrete drainage channels located on site and along the eastern and southern property boundaries. The site is bounded on the north and west by residential properties, and on the east and south by industrial buildings.

The existing site condition is divided into three (3) drainage basins, Basins Am B, and C, and three (3) separate discharge locations across the project site.

Treatment of storm water runoff from the site has been addressed in a separate report- *Storm Water Quality Management Plan for OnPoint Development, Project Shinohara by PLSA,* dated May 20, 2022.

Per City of Chula Vista general design criteria, the Modified Rational Method should be used to determine peak flowrates when the contributing drainage area is up to 1.0 square mile in size. All public and private drainage facilities shall be designed for a 100-year frequency storm.

Methodology used for the computation of design rainfall events, runoff coefficients, and rainfall intensity values are consistent with the criteria set forth in Section 3 – General Design Criteria of the City of Chula Vista Subdivision Manual, revised March 2012.

1.2 Pre-Project Conditions

Topographically, the site slopes steeply to the south from the northern property boundary, forming three (3) drainage basins with three (3) discharge locations. Existing Drainage Basin A comprises the western portion of the site. Runoff drains via overland flow to an existing concrete swale located at the southern property boundary. The drainage swale carries flow east to an existing Type F catch basin at the southern property boundary. The catch basin connects to an existing private storm drain pipe that outlets via curb outlet onto Main Street.

Existing Drainage Basin B comprises the eastern portion of the site. Runoff is conveyed via overland surface flow to an existing concrete drainage channel located at the southeastern corner of the site. The drainage channel conveys runoff south and outlets via curb outlet onto Main Street.

From Main Street, flow travels west via concrete curb and gutter to an existing curb inlet. Stormwater is then conveyed south through an existing storm drain pipe and outlets over headwall into the Otay River. The Otay River travels west and outlets at the San Diego Bay and ultimately the Pacific Ocean.

The site is not within a FEMA 100-year floodplain boundary or regulatory floodway.

Existing Drainage Basin C comprises the northwesterly portion of the site. Runoff is conveyed via overland surface flow to an existing swale west of the project site. Local surface runoff from the project site and surrounding properties collect in this area and flow to the south to an existing concrete drainage channel located in the rear yard of an existing single family residence at the end of Tanoak Court. The existing concrete channel flows to the south and then turns and flows to the west and discharges into Tanoak Court through two existing Type A curb outlets.

Per the United States Department of Agriculture (USDA) Web Soil Survey, the project site is Hydrologic Soil Group C and D. Refer to Appendix C of this report for the USDA Web Soil Survey and geotechnical findings.

Table 1.1 below summarizes the pre-project condition 100-year peak flows at the project's discharge locations. For delineated basin details, please refer to the Pre-Project Condition Hydrology Node Map included in Appendix 1 of this report.

TABLE 1.1 – Summary of Pre-Project Conditions

Existing Drainage Basin	Drainage Area (ac)	Runoff Coefficient, C	Time of Concentration, Tc (min)	Intensity, I (in/hr)	Pre-Project Q100 (cfs)
Basin A	2.79	0.55	9.15	4.70	7.20
Basin B	6.13	0.55	8.86	4.57	15.42
Basin C	0.79	0.55	4.77	6.32	2.78
Total	9.71	0.55			25.40

1.3 Post-Project Conditions

The project will include the construction of an industrial building, paved drive aisles and parking areas, retaining walls, and other associated improvements. Private drainage improvements will consist of catch basins, curb inlets and storm drain pipes. Proprietary Modular Wetland Systems are proposed for storm water treatment. An underground detention vault is proposed for peak flow attenuation. The project will be accessed by a proposed driveway off Shinohara Lane. The proposed land use is ILP- Limited Industrial.

The proposed site will consist of two (2) major drainage basins with two (2) discharge locations which match the existing drainage discharge points and pre-project peak flow rates for Existing Drainage Basins A and B. The proposed project's area in the northwesterly corner of the project site that comprised Existing Drainage Basin C is proposed to be included in Proposed Drainage Basin A. This will enable the proposed project to collect and convey runoff from this location to the project's peak flow detention facility and storm water treatment and no longer discharge runoff on an existing single family residential property. While the size of Proposed Drainage Basin A is larger than the size of Existing Drainage Basin A when comparing areas, the proposed project will provide peak flow detention so the peak flow runoff rate from this basin for the post-project condition will be equal to or less than the pre-project condition.

Storm water runoff from a majority of the proposed development (DMA-A) is routed to a series of BMPs including a Contech CDS pretreatment unit, a StormTrap underground detention vault and a BioClean Modular Wetland System (MWS). The underground detention vault has been designed to meet 100-year peak flow detention requirements. The Modular Wetland System is designed as a proprietary biofiltration

BMP for storm water treatment. Outflows from the detention vault and MWS are discharged through a proposed storm drain pipe to the existing Type F catch basin at the southern property boundary. Stormwater is then conveyed through the neighboring property to the south through an existing private storm drain and outlets onto Main Street as in existing conditions.

Storm water runoff from the proposed driveway (DMA-B) will be drained to a Modular Wetland System for storm water treatment. The MWS will be designed with a 3-foot-wide curb inlet opening and a 1-inch local curb depression to capture the required water quality flow. Runoff that exceeds the water quality flow rate or capacity of the MWS will flow by the MWS and drain to the existing concrete drainage channel at the southeast corner of the project site. Outflows from the MWS will be pumped to a proposed curb outlet along the southern property boundary and discharged to the existing concrete drainage channel. The concrete drainage channel discharges onto Main Street via curb outlet as in existing conditions. The characteristics of existing stormwater flows through the neighboring property will not change as a result of the proposed project.

Runoff from the cut slope at the northwest portion of the project site will be conveyed via proposed brow ditch to the existing Type F catch basin at the southern property boundary. This area (DMA-C) is considered a Self-Mitigating DMA per Chapter 5.2.1 of the City of Chula Vista BMP Design Manual.

All project site runoff is discharged onto Main Street as in existing conditions. From Main Street, flow travels west via concrete curb and gutter to an existing curb inlet. Stormwater is then conveyed south through an existing storm drain and outlets over headwall into the Otay River. The Otay River travels west and outlets at the San Diego Bay and ultimately the Pacific Ocean. The Otay River is considered an exempt river reach per the WMAA; therefore, the project is exempt from hydromodification management requirements.

The underground detention vault has been designed to provide flow control in the form of volume reduction and peak flow attenuation. The vault has been modified to include a low-flow and mid-flow orifice outlet and an overflow weir to control peak flows. The required water quality treatment flow is diverted to the downstream Modular Wetland System in accordance with Worksheet B.5-5 of the City of Chula Vista BMP Design Manual. Overflow relief for the 100-year storm event is provided with a partition weir installed within the vault and discharged directly to the existing Type F catch basin at the southern property boundary.

Table 1.2 below summarizes the post-project condition 100-year peak flows at the project's discharge locations. For delineated basin details, please refer to the Post-Project Condition Hydrology Node Map included as an Attachment of this report.

TABLE 1.2 – Summary of Post-Project Conditions

Proposed Drainage Basin	Drainage Area (ac)	Runoff Coefficient, C	Time of Concentration, Tc (min)	Intensity, I (in/hr)	Post-Project Q100 (cfs)	Required Detention (cfs)
Basin A	8.52	0.79	8.78	4.60	33.45	26.25
Basin B	1.19	0.80	5.55	6.07	5.77	--
Total	9.71	0.79			39.22	26.25

2. METHODOLOGY

Runoff calculations for Project Shinohara have been performed in accordance with Section 3 – General Design Criteria of the City of Chula Vista Subdivision Manual dated March 2012. Per City of City of Chula Vista design criteria, the Modified Rational Method should be used to determine peak flowrates for local drainage basins. Advanced Engineering Software (AES) were used to calculate the peak runoff from the 100-year, 6-hour storm event using the Rational Method. Please refer to this report's Appendix for the results of these calculations.

2.1 Rational Method

As mentioned above, runoff from the project site was calculated for the 100-year storm event. Runoff was calculated using the Rational Method which is given by the following equation:

$Q = C \times I \times A$

Where:
Q = Flow rate in cubic feet per second (cfs)
C = Runoff coefficient
I = Rainfall Intensity in inches per hour (in/hr)
A = Drainage basin area in acres, (ac)

Rational Method calculations were performed using the AES 2008 computer program. To perform the hydrology routing, the total watershed area is divided into sub-areas which discharge at designated nodes. The procedure for the sub-area summation model is as follows:

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

(2) Estimate an initial T_c by using the appropriate nomograph or overland flow velocity estimation. The minimum T_c considered is 5.0 minutes. All T_c values for the proposed project were assumed to be 5 minutes due to the small size of each contributing drainage area.

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

(4) Using Q, estimate the travel time between this node and the next by Manning's equation as applied to 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)

2.2 Runoff Coefficient

In accordance with City of Chula Vista design standards, runoff coefficients were based on land use. An appropriate runoff coefficient (C) for each type of land use in the subarea was selected from Section 3-203.3 of the City of Chula Vista Subdivision Manual and multiplied by the percentage of total area (A) included in that class. The sum of products for all land uses is the weighted runoff coefficient (∑[C]). See Tables 2.1 and 2.2 below for weighted runoff coefficient "C" calculations. The Pre-Project and Post-Project Condition Hydrology Node Maps show the drainage basin subareas, on-site drainage system and nodal points.

Runoff coefficients of 0.55 and 0.60 were selected from Section 3-203.3 for hilly and steep vegetated slopes, consistent with existing conditions. The existing site is assumed to be 0% impervious. See Table 2.1 below for pre-project condition weighted runoff coefficient "C" calculations.

In the post-project condition, the developed site was assigned a runoff coefficient of 0.85 for commercial area. Developed slopes along the northern and southern property boundary were classified as steep per Section 3-203.3 and assigned a runoff coefficient of 0.60. See Table 2.2 on the following page for post-project condition weighted runoff coefficient "C" calculations.

TABLE 2.1- Summary of Pre-Project Condition Weighted Runoff Coefficient Calculations

Pre-Project Condition - Weighted Runoff Coefficient							
Up Node	Down Node	Area (ac)	C_1	A_1	C_2	A_2	C
10	11	0.04	0.55	0.04	0.60	0.00	0.55
11	12	2.75	0.55	2.75	0.60	0.00	0.55
20	21	0.09	0.55	0.09	0.60	0.00	0.55
21	22	6.01	0.55	6.01	0.60	0.00	0.55
30	31	0.08	0.55	0.08	0.60	0.00	0.55
31	32	0.72	0.55	0.72	0.60	0.00	0.55

Note: C values taken from Section 3-203.3 of the City of Chula Vista Subdivision Manual
Runoff Coefficient of 0.55 for Vegetated Slopes, Hilly
Runoff Coefficient of 0.60 for Vegetated Slopes, Steep

TABLE 2.2- Summary of Post-Project Condition Weighted Runoff Coefficient Calculations

Post-Project Condition - Weighted Runoff Coefficient							
Up Node	Down Node	Area (ac)	C_1	A_1	C_2	A_2	C
100	101	0.04	0.85	0.04	0.60	0.00	0.85
101	102	0.34	0.85	0.34	0.60	0.00	0.85
103	103	0.20	0.85	0.20	0.60	0.00	0.85
104	104	0.38	0.85	0.38	0.60	0.00	0.85
105	105	0.20	0.85	0.20	0.60	0.00	0.85
106	106	0.41	0.85	0.41	0.60	0.00	0.85
107	107	0.14	0.85	0.14	0.60	0.00	0.85
107	107	0.39	0.85	0.00	0.60	0.39	0.60
108	108	0.12	0.85	0.12	0.60	0.00	0.85
109	109	0.12	0.85	0.12	0.60	0.00	0.85
110	110	0.11	0.85	0.11	0.60	0.00	0.85
111	111	0.06	0.85	0.06	0.60	0.00	0.85
112	112	0.29	0.85	0.29	0.60	0.00	0.85
113	113	0.27	0.85	0.27	0.60	0.00	0.85
114	114	0.94	0.85	0.94	0.60	0.00	0.85
115	115	0.80	0.85	0.80	0.60	0.00	0.85
117	118	0.04	0.85	0.04	0.60	0.00	0.85
118	119	0.34	0.85	0.34	0.60	0.00	0.85
120	120	0.08	0.85	0.08	0.60	0.00	0.85
121	121	0.22	0.85	0.22	0.60	0.00	0.85
122	122	0.38	0.85	0.38	0.60	0.00	0.85
123	123	0.35	0.85	0.35	0.60	0.00	0.85
124	124	0.19	0.85	0.19	0.60	0.00	0.85
125	125	0.11	0.85	0.11	0.60	0.00	0.85
126	126	0.16	0.85	0.16	0.60	0.00	0.85
127	127	0.16	0.85	0.16	0.60	0.00	0.85
128	128	0.20	0.85	0.20	0.60	0.00	0.85
129	129	0.37	0.85	0.37	0.60	0.00	0.85
131	131	0.84	0.85	0.00	0.60	0.84	0.60
136	136	0.25	0.85	0.00	0.60	0.25	0.60
200	201	0.16	0.85	0.16	0.60	0.00	0.85
201	202	1.03	0.85	0.79	0.60	0.24	0.79

Note: C values taken from Section 3-203.3 of the City of Chula Vista Subdivision Manual
Runoff Coefficient of 0.85 for Commercial Area
Runoff Coefficient of 0.60 for Vegetated Slopes, Steep

2.3 Rainfall Intensity

Rainfall intensity is calculated per Section 3-203.3 of the City of Chula Vista Subdivision Manual, which is given by the following equation:

$I = 7.44P_6D^{-0.645}$

Where:
I = Rainfall Intensity in inches per hour (in/hr)
P_6 = Adjusted 6-hour storm precipitation
D = Duration in minutes (use Tc)

The intensity values for varying time of concentrations were input manually into the AES computer program where runoff calculations were performed. The 6-hour storm rainfall amount (P_6) for the 100-year storm frequency was determined using City of Chula Vista Isopluvial Maps provided from Figure 7 of the City of Chula Vista Drainage Master Plan. The P_6 for the 100-year storm frequency was found as 2.4 inches. See Appendix 3 of this report for Isopluvial maps for the 100-year rainfall event.

2.4 Tributary Areas

Drainage basins for the existing and proposed project site are delineated in the Pre-Project and Post-Project Condition Hydrology Node Maps located in Appendix 1 and 2 of this report and graphically portray the tributary area for each drainage basin.

2.5 Hydraulics

The hydraulics of existing and proposed storm drain pipes were analyzed using the AES computer program. For pipe flow, a Manning's N value of 0.011 was used to reflect the use of HDPE pipe. A Manning's N value of 0.013 was used to reflect the use of RCP pipe.

2.6 Curb Inlet and Catch Basin Sizing

Curb inlets and catch basins will be sized in accordance with City of Chula Vista Subdivision Manual (March 2012) upon final engineering.

2.7 Detention Basin Routing

The detention facility was modeled using the Army Corps of Engineers HEC-HMS 4.3 software. Hydraulic Modified-Puls detention routing was performed to analyze the developed condition 100-year peak flow rate at the project's detention system. Stage-storage-discharge tables were generated and input into HEC-HMS to model the design of the vault outlet structure. This procedure was selected in order to model the flow control requirements and to accurately represent the middle stages of the BMP for accurate mid-flow orifice and emergency weir sizing. The stage-storage-discharge tables have been provided in Appendix 5. The HEC-HMS Modified-Puls results are summarized in Table 2.3 on the following page.

TABLE 2.3- Summary of Detention Basin Routing

Detention Basin	Tributary Area (ac)	Runoff Coefficient, C	Inflow Tc (min)[1]	100-Year Peak Inflow (cfs)	Outflow Tc (min)	100-Year Peak Outflow (cfs)	Peak Elevation (ft)[2]
BMP-1	8.27	0.85	10	33.45	19	6.99	5.37

Notes: (1) Inflow time of concentration rounded to the nearest time interval that HEC-HMS could accept
(2) Peak elevation measured from the invert of the mid-flow orifice

A Rational method inflow hydrograph was generated using RickRat Hydro software from Rick Engineering. The parameters of the drainage area were entered into RickRat Hydro software to generate an inflow hydrograph. The data from this hydrograph was then entered into HEC-HMS software to model the release rates from the detention system.

HEC-HMS allows for hydrology input time steps of 1, 2, 3, 4, 5, 6, 10, 15 & 20 minutes. Rick Rat Hydro requires a minimum time of concentration (Tc) of 5 minutes. Therefore, the time of concentration (Tc) used for the concentration of the hydrograph was rounded to the nearest time interval that RickRat Hydro and HEC-HMS could accept. The time of concentration used is 10 minutes. The peak flow remains as per the modified Rational Method analysis and is not reduced (or increased) from this hydrograph development accordingly.

Rational method hydrographs, stage-storage-discharge relationships and HEC-HMS model output is provided in Appendix 5 of this report.

3. CALCULATIONS/RESULTS

3.1 Pre- & Post-Development Peak Flow Comparison

Below are a series of tables which summarize the calculations provided in the appendices of this report.

Table 3.1 itemizes the pre-project condition peak flow rates for the 100-year storm event at the project's discharge locations.

TABLE 3.1- Pre-Project Condition Peak Flow Summary

Drainage Basin	Drainage Area (ac)	Runoff Coefficient, C	Pre-Project Q100 (cfs)
Basin A	2.79	0.55	7.20
Basin B	6.13	0.55	15.42
Basin C	0.79	0.55	2.78
Total	9.71	0.55	25.40

Table 3.2 itemizes the post-project and detained condition peak flow rates for the 100-year storm event at the project's discharge locations.

TABLE 3.2- Proposed Post-Project Condition Peak Flow Summary

Drainage Basin	Drainage Area (ac)	Runoff Coefficient, C	Post-Project Condition Q100 (cfs)	Detained Condition Q100 (cfs)
Basin A	8.52	0.79	33.45	7.17
Basin B	1.19	0.80	5.77	5.77
Total	9.71	0.79	39.22	12.94

Table 3.3 shows that the total storm water peak flow for the proposed development is less than the existing storm water peak flow for the 100-year rainfall event.

TABLE 3.3- Pre-Project Vs. Post-Project Detained Condition Peak Flow Summary

Pre-Project Condition Q100 (cfs)	Post-Project Detained Condition Q100 (cfs)	Pre-Project Vs. Post-Project Detained Condition Q100 (cfs)
25.40	12.94	-12.46

3.2 Storm Water Quality

The proposed site will include Modular Wetland Systems that will provide the required storm water quality treatment for the project. For information regarding BMP sizing and the water quality design, refer to the *Storm Water Quality Management Plan for Project Shinohara, OnPoint Development by PLSA,* dated May 20, 2022, under separate cover.

3.3 Hydromodification

The project is exempt from hydromodification management requirements. For additional information regarding hydromodification exemption, refer to the *Storm Water Quality Management Plan for Project Shinohara, OnPoint Development by PLSA,* dated May 20, 2022, under separate cover.

4. CONCLUSION

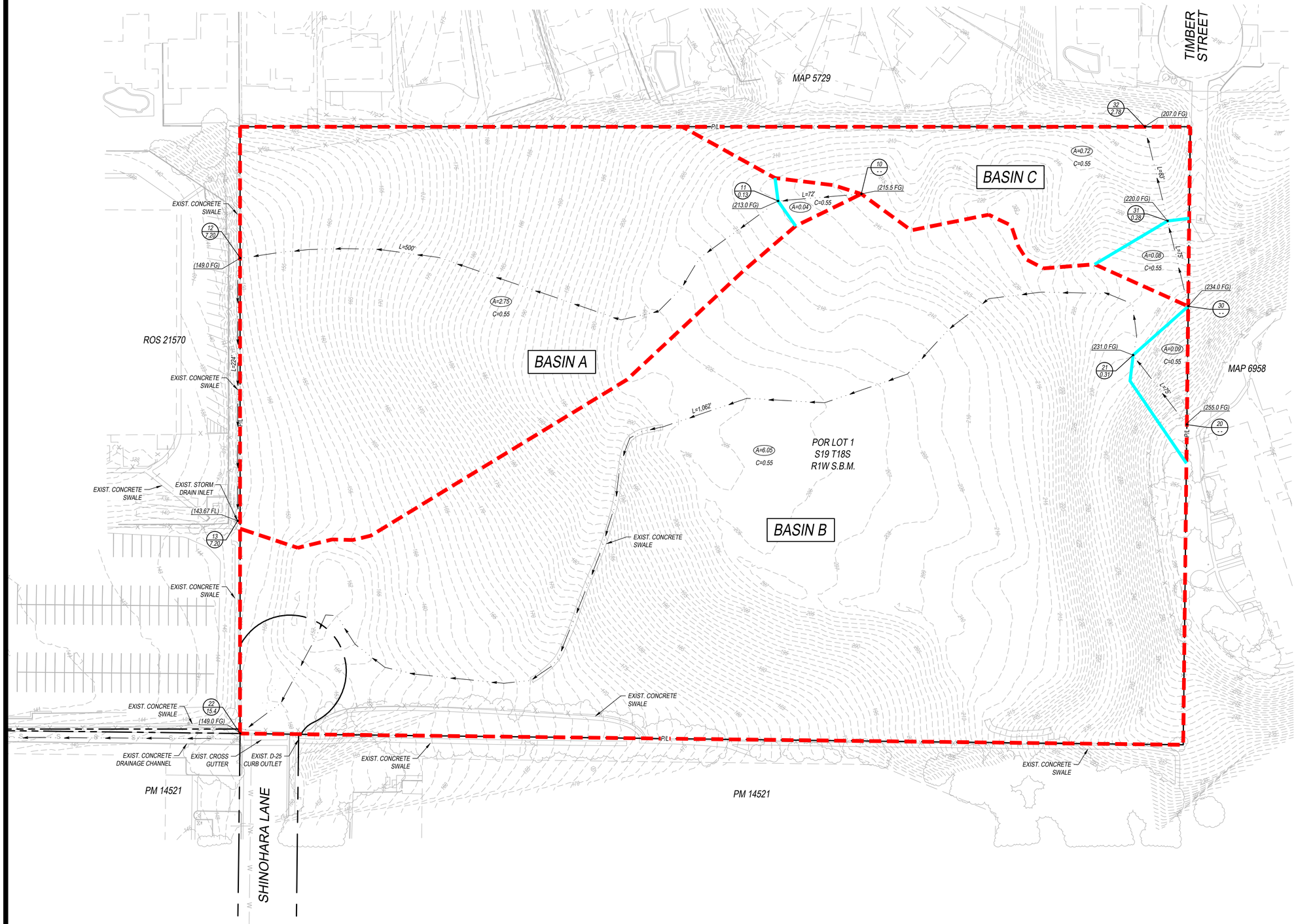
This report analyzed the 100-year storm event hydrology for the proposed site using the Advanced Engineering Software (AES) and demonstrates that the post-developed peak flow rates are less than the pre-developed peak flow rates at the project's two existing discharge locations. In addition, the proposed storm drain system was sized adequately to convey the proposed project's runoff and supporting calculations can be found in the appendices of this report.

The proposed project will not substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on or off-site. In addition, the proposed project will not increase the peak runoff rate for the post-project condition when compared to the pre-project condition.

The project is not within the FEMA 100-year floodplain boundary as mapped on the Flood Insurance Rate Map.

Appendix 1

Pre-Project Condition Hydrology Node Map



LEGEND

DESCRIPTION	SYMBOL
HYDROLOGY NODE Q100 (CFS)	10 1.00
SUB-BASIN AREA	A=0.10
WEIGHTED RUNOFF COEFFICIENT	C=0.55
RIGHT-OF-WAY	R/W
PROPERTY LINE	P/L
BASIN BOUNDARY	
SUB-BASIN BOUNDARY	
FLOWLINE	

HYDROLOGIC SOIL GROUP

HYDROLOGIC SOIL TYPE: C & D

DEPTH TO GROUNDWATER

DEPTH TO GROUNDWATER > 20 FT

PROJECT CHARACTERISTICS

PARCEL AREA:	9.73 AC
EXISTING DRAINAGE BOUNDARY:	9.71 AC
EXISTING IMPERVIOUS AREA:	0 AC
EXISTING PERVIOUS / LANDSCAPE AREA:	9.71 AC

RUNOFF COEFFICIENT

IN ACCORDANCE WITH SECTION 3 - GENERAL DESIGN CRITERIA OF THE CITY OF CHULA VISTA SUBDIVISION MANUAL, RUNOFF COEFFICIENTS WERE BASED ON LAND USE. AN APPROPRIATE RUNOFF COEFFICIENT WAS SELECTED FROM SECTION 3-203.3 AND MULTIPLIED BY THE PERCENTAGE OF TOTAL AREA IN THAT CLASS. THE SUM OF THE PRODUCTS FOR ALL LAND USES IS THE WEIGHTED RUNOFF COEFFICIENT.

SEE TABLE 2.1 OF THE "PRELIMINARY DRAINAGE STUDY FOR PROJECT SHINOHARA" BY PLSA DATED FEBRUARY 2022 FOR PRE-PROJECT CONDITION WEIGHTED RUNOFF COEFFICIENT "C" CALCULATIONS.

SUMMARY OF EXISTING CONDITION 100-YEAR PEAK FLOWS

DRAINAGE BASIN	DRAINAGE AREA (AC)	IMPERVIOUS AREA (AC)	% IMP	WEIGHTED RUNOFF COEFFICIENT, C	100-YEAR EXISTING PEAK FLOW (CFS)
BASIN A	2.79	0.00	0.0%	0.55	7.20
BASIN B	6.13	0.00	0.0%	0.55	15.42
BASIN C	0.79	0.00	0.0%	0.55	2.78
TOTAL	9.71	0.00	0.0%	0.55	25.40

40' 20' 0 40' 80' 120'

SCALE: 1" = 40'

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PRE-PROJECT CONDITION HYDROLOGY NODE MAP

SHINOHARA BUSINESS PARK
517 SHINOHARA LANE
CHULA VISTA, CA 91911
PLSA JOB NO. 3690
MAY 2022

Appendix 2

Post-Project Condition Hydrology Node Map

LEGEND

DESCRIPTION	SYMBOL
HYDROLOGY NODE POST-PROJECT DETAINED Q100 (CFS)	100 1.00
SUB-BASIN AREA	A=0.10
WEIGHTED RUNOFF COEFFICIENT	C=0.85
RIGHT-OF-WAY	R/W
PROPERTY LINE	P/L
BASIN BOUNDARY	
SUB-BASIN BOUNDARY	
FLOWLINE	

HYDROLOGIC SOIL GROUP

HYDROLOGIC SOIL TYPE: C & D

DEPTH TO GROUNDWATER

DEPTH TO GROUNDWATER > 20 FT

PROJECT CHARACTERISTICS

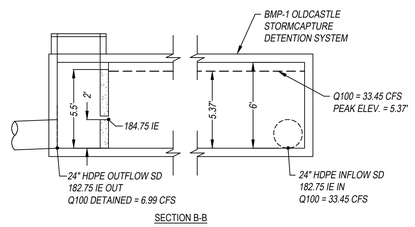
PARCEL AREA:	9.73 AC
PROPOSED DRAINAGE BOUNDARY:	9.71 AC
PROPOSED DISTURBED AREA:	9.67 AC
PROPOSED IMPERVIOUS AREA:	8.03 AC
PROPOSED PERVIOUS / LANDSCAPE AREA:	1.64 AC

RUNOFF COEFFICIENT

IN ACCORDANCE WITH SECTION 3 -GENERAL DESIGN CRITERIA OF THE CITY OF CHULA VISTA SUBDIVISION MANUAL, RUNOFF COEFFICIENTS WERE BASED ON LAND USE. AN APPROPRIATE RUNOFF COEFFICIENT WAS SELECTED FROM SECTION 3-203.3 AND MULTIPLIED BY THE PERCENTAGE OF TOTAL AREA IN THAT CLASS. THE SUM OF THE PRODUCTS FOR ALL LAND USES IS THE WEIGHTED RUNOFF COEFFICIENT.

SEE TABLE 2.2 OF THE "PRELIMINARY DRAINAGE STUDY FOR PROJECT SHINOHARA, ONPOINT DEVELOMENT" BY PLSA DATED MAY 2022 FOR POST-PROJECT CONDITION WEIGHTED RUNOFF COEFFICEINT "C" CALCULATIONS.

SECTION A-A



SECTION B-B



BMP-1 STORMCAPTURE DETENTION SYSTEM DETAIL

NOT TO SCALE

SUMMARY OF PROPOSED CONDITION 100-YEAR PEAK FLOWS

DRAINAGE BASIN	POC	DRAINAGE AREA (AC)	IMPERVIOUS AREA (AC)	% IMP	WEIGHTED RUNOFF COEFFICIENT, C	POST-PROJECT Q100 (CFS)	POST-PROJECT DETAINED Q100 (CFS)
BASIN A	POC-1	8.52	7.36	86.4%	0.83	33.45	7.17
BASIN B	POC-2	1.19	0.68	56.8%	0.80	5.77	5.77
TOTAL	--	9.71	8.03	82.7%	0.83	39.22	12.94

NOTE: UNMITIGATED PEAK FLOW IS THE POST-PROJECT PEAK FLOW THAT HAS NOT BEEN REDUCED FROM DETENTION ROUTING.
MITIGATED PEAK FLOW IS THE POST-PROJECT PEAK FLOW THAT HAS BEEN REDUCED BY ROUTING FLOW THROUGH THE PROJECT'S DETENTION FACILITY.

40' 20' 0 40' 80' 120'

SCALE: 1" = 40'

PASCO LARET SUITER & ASSOCIATES
San Diego | Encinitas | Orange County
Phone 858.259.8212 | www.plsaengineering.com

POST-PROJECT CONDITION HYDROLOGY NODE MAP

SHINOHARA BUSINESS PARK
517 SHINOHARA LANE
CHULA VISTA, CA 91911
PLSA JOB NO. 3690
MAY 2022

Appendix 3

Hydrology Design Summary



Map Scale: 1:1,500 if printed on A portrait (8.5" x 11") sheet.

N

0 20 40 80 120 Meters

0 50 100 200 300 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 15, May 27, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 22, 2018—Aug 31, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
OhE	Olivenhain cobbly loam, 9 to 30 percent slopes	D	7.5	71.3%
SbC	Salinas clay loam, 2 to 9 percent slopes	C	3.0	28.7%
Totals for Area of Interest			**10.5**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

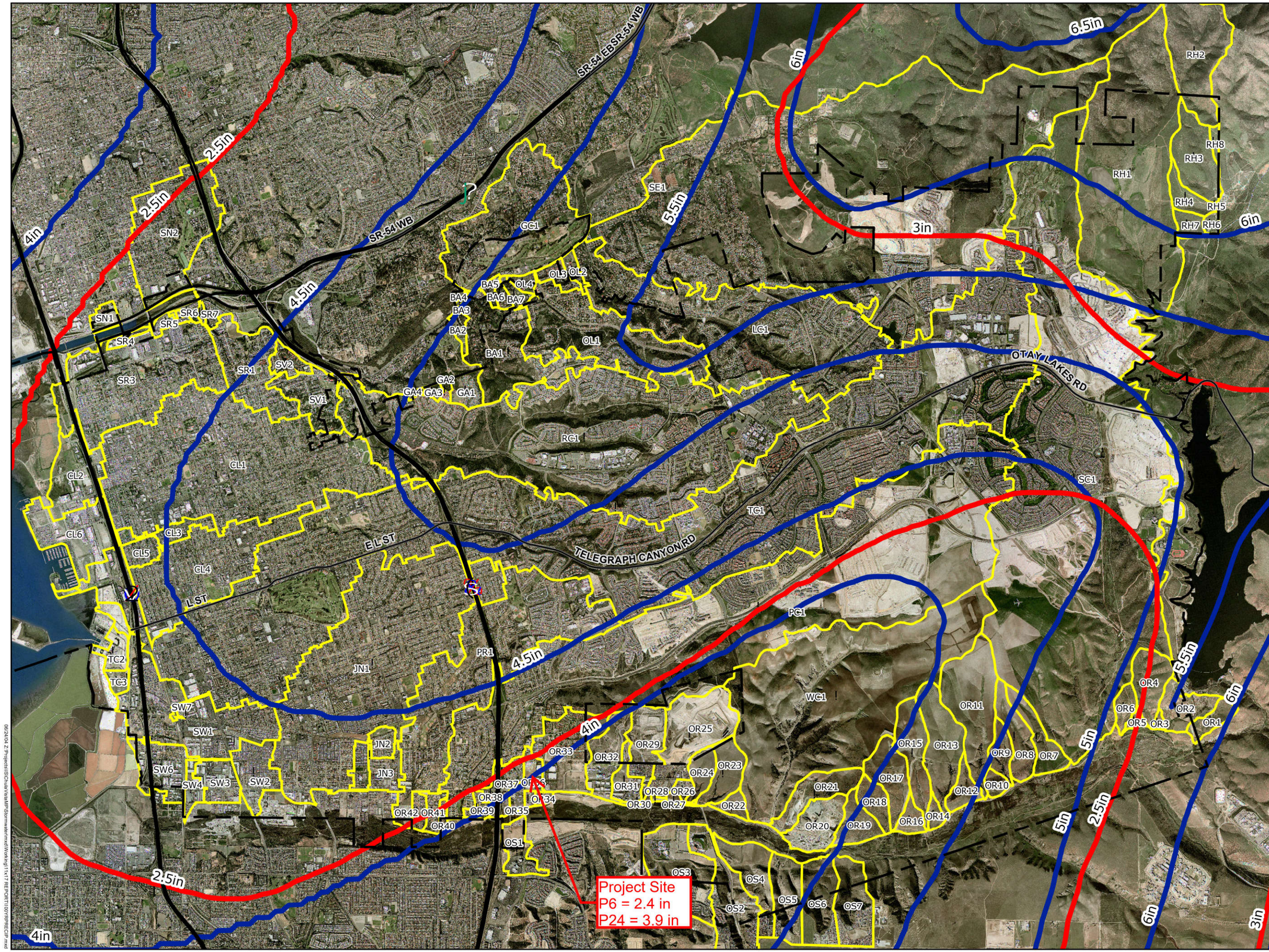
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



Chula Vista Drainage Master Plan

Figure 7: Rainfall Isopluvials

100 Year Rainfall Event

- 6 Hour Isopluvial
- 24 Hour Isopluvial

1 inch equals 4,200 feet

CITY OF CHULA VISTA

PBSJ

Map Date:	Feb 12, 2004
Projection:	State Plane
Datum:	NAD 83
Zone:	California VI
Units:	Feet

Appendix 4

AES Rational Method Calculations

100-YEAR PRE-PROJECT CONDITION

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2008 Advanced Engineering Software (aes)
              Ver. 15.0 Release Date: 04/01/2008  License ID 1452

                              Analysis prepared by:

                         PASCO LARET SUITER & ASSOCIATES
                              535 NORTH HIGHWAY 101
                                     SUITE A
                              SOLANA BEACH CA 92705

------------------------------------------------------------------------------
  FILE NAME: 3690E100.DAT
  TIME/DATE OF STUDY: 12:51 02/24/2022
------------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  9
   1)   5.000;  6.323
   2)  10.000;  4.044
   3)  15.000;  3.113
   4)  20.000;  2.586
   5)  25.000;  2.239
   6)  30.000;  1.991
   7)  40.000;  1.654
   8)  50.000;  1.432
   9)  60.000;  1.273
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *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 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 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     10.00 TO NODE     11.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    72.00
  UPSTREAM ELEVATION(FEET) =    215.50
```

```
  DOWNSTREAM ELEVATION(FEET) =    213.00
  ELEVATION DIFFERENCE(FEET) =      2.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.548
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.073
  SUBAREA RUNOFF(CFS) =      0.13
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.13

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    213.00  DOWNSTREAM(FEET) =    149.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   500.00   CHANNEL SLOPE =  0.1280
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.040   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.695
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.76
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.76
  AVERAGE FLOW DEPTH(FEET) =   0.11   TRAVEL TIME(MIN.) =   3.02
  Tc(MIN.) =    8.57
  SUBAREA AREA(ACRES) =     2.75       SUBAREA RUNOFF(CFS) =    7.10
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.550
  TOTAL AREA(ACRES) =        2.8         PEAK FLOW RATE(CFS) =       7.20

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.16   FLOW VELOCITY(FEET/SEC.) =   3.33
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     572.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    149.00  DOWNSTREAM(FEET) =    143.67
  CHANNEL LENGTH THRU SUBAREA(FEET) =   224.00   CHANNEL SLOPE =  0.0238
  CHANNEL BASE(FEET) =    2.50   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       7.20
  FLOW VELOCITY(FEET/SEC.) =   6.48   FLOW DEPTH(FEET) =   0.35
  TRAVEL TIME(MIN.) =   0.58   Tc(MIN.) =    9.15
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     13.00 =     796.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    255.00
  DOWNSTREAM ELEVATION(FEET) =    231.00
  ELEVATION DIFFERENCE(FEET) =     24.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.980
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.323
```

```
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.31
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.31

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    231.00  DOWNSTREAM(FEET) =    149.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1062.00   CHANNEL SLOPE =  0.0772
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.040   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.565
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       8.20
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.63
  AVERAGE FLOW DEPTH(FEET) =   0.29   TRAVEL TIME(MIN.) =   4.88
  Tc(MIN.) =    8.86
  SUBAREA AREA(ACRES) =     6.05       SUBAREA RUNOFF(CFS) =   15.19
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.550
  TOTAL AREA(ACRES) =        6.1         PEAK FLOW RATE(CFS) =      15.42

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.39   FLOW VELOCITY(FEET/SEC.) =   4.38
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =    1137.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    234.00
  DOWNSTREAM ELEVATION(FEET) =    220.00
  ELEVATION DIFFERENCE(FEET) =     14.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.980
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.323
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.28
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.28

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    220.00  DOWNSTREAM(FEET) =    207.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    83.00   CHANNEL SLOPE =  0.1566
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =   8.000
  MANNING'S FACTOR = 0.040   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.323
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5500
```

```
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.53
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.75
  AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =   0.79
  Tc(MIN.) =    4.77
  SUBAREA AREA(ACRES) =     0.72       SUBAREA RUNOFF(CFS) =    2.50
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.550
  TOTAL AREA(ACRES) =        0.8         PEAK FLOW RATE(CFS) =       2.78

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   2.34
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =     158.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.8  TC(MIN.) =      4.77
  PEAK FLOW RATE(CFS)   =       2.78
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

100-YEAR POST-PROJECT CONDITION

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2016 Advanced Engineering Software (aes)
              Ver. 23.0 Release Date: 07/01/2016  License ID 1452

                              Analysis prepared by:




------------------------------------------------------------------------------
  FILE NAME: 3690P100.DAT
  TIME/DATE OF STUDY: 09:19 05/20/2022
------------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  9
   1)   5.000;  6.323
   2)  10.000;  4.044
   3)  15.000;  3.113
   4)  20.000;  2.586
   5)  25.000;  2.239
   6)  30.000;  1.991
   7)  40.000;  1.654
   8)  50.000;  1.432
   9)  60.000;  1.273
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *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 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 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):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    194.20
```

```
 DOWNSTREAM ELEVATION(FEET) =    193.70
 ELEVATION DIFFERENCE(FEET) =      0.50
 URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.182
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.323
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.21
 TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.21

****************************************************************************
 FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    193.70  DOWNSTREAM(FEET) =    192.50
 CHANNEL LENGTH THRU SUBAREA(FEET) =   118.00   CHANNEL SLOPE =  0.0102
 CHANNEL BASE(FEET) =   50.00   "Z" FACTOR =  50.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.072
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.10
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.83
 AVERAGE FLOW DEPTH(FEET) =   0.03   TRAVEL TIME(MIN.) =   2.37
 Tc(MIN.) =    5.55
 SUBAREA AREA(ACRES) =     0.34       SUBAREA RUNOFF(CFS) =    1.75
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
 TOTAL AREA(ACRES) =        0.4         PEAK FLOW RATE(CFS) =       1.96

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.04   FLOW VELOCITY(FEET/SEC.) =   1.07
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     168.00 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) =   192.50  DOWNSTREAM(FEET) =   191.30
 FLOW LENGTH(FEET) =    29.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   8.79
 ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       1.96
 PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    5.60
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =     197.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.047
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
 SUBAREA AREA(ACRES) =    0.20   SUBAREA RUNOFF(CFS) =    1.03
 TOTAL AREA(ACRES) =        0.6   TOTAL RUNOFF(CFS) =       2.98
 TC(MIN.) =    5.60
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   190.97  DOWNSTREAM(FEET) =   190.35
  FLOW LENGTH(FEET) =   103.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   9.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.61
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.98
  PIPE TRAVEL TIME(MIN.) =   0.37    Tc(MIN.) =    5.98
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =     300.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.877
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
  SUBAREA AREA(ACRES) =    0.38   SUBAREA RUNOFF(CFS) =    1.90
  TOTAL AREA(ACRES) =        1.0   TOTAL RUNOFF(CFS) =       4.80
  TC(MIN.) =    5.98

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   190.35  DOWNSTREAM(FEET) =   190.05
  FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.26
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.80
  PIPE TRAVEL TIME(MIN.) =   0.16    Tc(MIN.) =    6.14
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =     350.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.805
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
  SUBAREA AREA(ACRES) =    0.20   SUBAREA RUNOFF(CFS) =    0.99
  TOTAL AREA(ACRES) =        1.2   TOTAL RUNOFF(CFS) =       5.72
  TC(MIN.) =    6.14

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   190.05  DOWNSTREAM(FEET) =   189.72
  FLOW LENGTH(FEET) =    54.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  12.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.40
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.72
  PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =    6.30
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =     404.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.729
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
  SUBAREA AREA(ACRES) =    0.41   SUBAREA RUNOFF(CFS) =    2.00
  TOTAL AREA(ACRES) =        1.6   TOTAL RUNOFF(CFS) =       7.65
  TC(MIN.) =    6.30

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    107.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   189.72  DOWNSTREAM(FEET) =   189.30
  FLOW LENGTH(FEET) =    70.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.91
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.65
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =    6.50
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    107.00 =     474.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.639
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
  SUBAREA AREA(ACRES) =    0.14   SUBAREA RUNOFF(CFS) =    0.67
  TOTAL AREA(ACRES) =        1.7   TOTAL RUNOFF(CFS) =       8.20
  TC(MIN.) =    6.50

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.639
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8036
```

```
  SUBAREA AREA(ACRES) =    0.39   SUBAREA RUNOFF(CFS) =    1.32
  TOTAL AREA(ACRES) =        2.1   TOTAL RUNOFF(CFS) =       9.52
  TC(MIN.) =    6.50

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    108.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   188.97  DOWNSTREAM(FEET) =   188.35
  FLOW LENGTH(FEET) =   102.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  12.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.34
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.52
  PIPE TRAVEL TIME(MIN.) =   0.27    Tc(MIN.) =    6.77
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    108.00 =     576.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    108.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.517
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8061
  SUBAREA AREA(ACRES) =    0.12   SUBAREA RUNOFF(CFS) =    0.56
  TOTAL AREA(ACRES) =        2.2   TOTAL RUNOFF(CFS) =       9.87
  TC(MIN.) =    6.77

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    109.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   188.02  DOWNSTREAM(FEET) =   187.46
  FLOW LENGTH(FEET) =    94.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.34
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.87
  PIPE TRAVEL TIME(MIN.) =   0.25    Tc(MIN.) =    7.02
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    109.00 =     670.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    109.00 TO NODE    109.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.404
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8083
  SUBAREA AREA(ACRES) =    0.12   SUBAREA RUNOFF(CFS) =    0.55
  TOTAL AREA(ACRES) =        2.3   TOTAL RUNOFF(CFS) =      10.22
  TC(MIN.) =    7.02

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

```
 FLOW PROCESS FROM NODE    109.00 TO NODE    110.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   187.13  DOWNSTREAM(FEET) =   186.57
 FLOW LENGTH(FEET) =    94.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.38
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      10.22
 PIPE TRAVEL TIME(MIN.) =   0.25    Tc(MIN.) =    7.26
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    110.00 =     764.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.293
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8102
 SUBAREA AREA(ACRES) =    0.11   SUBAREA RUNOFF(CFS) =    0.49
 TOTAL AREA(ACRES) =        2.4   TOTAL RUNOFF(CFS) =      10.51
 TC(MIN.) =    7.26

****************************************************************************
 FLOW PROCESS FROM NODE    110.00 TO NODE    111.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   186.24  DOWNSTREAM(FEET) =   185.50
 FLOW LENGTH(FEET) =   106.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  12.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.83
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      10.51
 PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =    7.52
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    111.00 =     870.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    111.00 TO NODE    111.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.175
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8112
 SUBAREA AREA(ACRES) =    0.06   SUBAREA RUNOFF(CFS) =    0.26
 TOTAL AREA(ACRES) =        2.5   TOTAL RUNOFF(CFS) =      10.54
 TC(MIN.) =    7.52

****************************************************************************
 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) =   185.17  DOWNSTREAM(FEET) =   184.87
 FLOW LENGTH(FEET) =    49.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.50
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      10.54
 PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    7.64
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    112.00 =     919.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    112.00 TO NODE    112.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.117
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8152
 SUBAREA AREA(ACRES) =    0.29   SUBAREA RUNOFF(CFS) =    1.26
 TOTAL AREA(ACRES) =        2.8   TOTAL RUNOFF(CFS) =      11.68
 TC(MIN.) =    7.64

****************************************************************************
 FLOW PROCESS FROM NODE    112.00 TO NODE    113.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   184.87  DOWNSTREAM(FEET) =   184.25
 FLOW LENGTH(FEET) =   104.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.55
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      11.68
 PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =    7.91
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    113.00 =    1023.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    113.00 TO NODE    113.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.997
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8182
 SUBAREA AREA(ACRES) =    0.27   SUBAREA RUNOFF(CFS) =    1.15
 TOTAL AREA(ACRES) =        3.1   TOTAL RUNOFF(CFS) =      12.55
 TC(MIN.) =    7.91

****************************************************************************
 FLOW PROCESS FROM NODE    113.00 TO NODE    114.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   184.25  DOWNSTREAM(FEET) =   183.93
 FLOW LENGTH(FEET) =    53.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.66
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
```

```
  PIPE-FLOW(CFS) =      12.55
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    8.04
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    114.00 =    1076.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    114.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.936
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8257
  SUBAREA AREA(ACRES) =    0.94   SUBAREA RUNOFF(CFS) =    3.94
  TOTAL AREA(ACRES) =        4.0   TOTAL RUNOFF(CFS) =      16.34
  TC(MIN.) =    8.04

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    115.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   183.93  DOWNSTREAM(FEET) =   183.63
  FLOW LENGTH(FEET) =    51.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  16.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.09
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      16.34
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =    8.16
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    115.00 =    1127.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    115.00 TO NODE    115.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.882
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8297
  SUBAREA AREA(ACRES) =    0.80   SUBAREA RUNOFF(CFS) =    3.32
  TOTAL AREA(ACRES) =        4.8   TOTAL RUNOFF(CFS) =      19.48
  TC(MIN.) =    8.16

****************************************************************************
  FLOW PROCESS FROM NODE    115.00 TO NODE    116.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   183.63  DOWNSTREAM(FEET) =   183.44
  FLOW LENGTH(FEET) =    31.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  18.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.39
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      19.48
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    8.23
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    116.00 =    1158.00 FEET.

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

```
  FLOW PROCESS FROM NODE    116.00 TO NODE    116.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    117.00 TO NODE    118.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    194.20
  DOWNSTREAM ELEVATION(FEET) =    193.70
  ELEVATION DIFFERENCE(FEET) =      0.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.182
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.323
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.21
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.21

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    119.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    193.70  DOWNSTREAM(FEET) =    192.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   118.00   CHANNEL SLOPE =  0.0102
  CHANNEL BASE(FEET) =   50.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.072
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.10
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.83
  AVERAGE FLOW DEPTH(FEET) =   0.03   TRAVEL TIME(MIN.) =   2.37
  Tc(MIN.) =    5.55
  SUBAREA AREA(ACRES) =     0.34       SUBAREA RUNOFF(CFS) =    1.75
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  TOTAL AREA(ACRES) =        0.4         PEAK FLOW RATE(CFS) =       1.96

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.04   FLOW VELOCITY(FEET/SEC.) =   1.07
  LONGEST FLOWPATH FROM NODE    117.00 TO NODE    119.00 =     168.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    119.00 TO NODE    120.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   192.50  DOWNSTREAM(FEET) =   191.51
  FLOW LENGTH(FEET) =    29.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.20
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.96
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    5.61
  LONGEST FLOWPATH FROM NODE    117.00 TO NODE    120.00 =     197.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.045
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8065
  SUBAREA AREA(ACRES) =    0.08   SUBAREA RUNOFF(CFS) =    0.29
  TOTAL AREA(ACRES) =        0.5   TOTAL RUNOFF(CFS) =       2.24
  TC(MIN.) =    5.61

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    121.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   191.18  DOWNSTREAM(FEET) =   190.82
  FLOW LENGTH(FEET) =    59.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.42
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.24
  PIPE TRAVEL TIME(MIN.) =   0.22    Tc(MIN.) =    5.83
  LONGEST FLOWPATH FROM NODE    117.00 TO NODE    121.00 =     256.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    121.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.944
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8206
  SUBAREA AREA(ACRES) =    0.22   SUBAREA RUNOFF(CFS) =    1.11
  TOTAL AREA(ACRES) =        0.7   TOTAL RUNOFF(CFS) =       3.32
  TC(MIN.) =    5.83

****************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   190.82  DOWNSTREAM(FEET) =   190.57
  FLOW LENGTH(FEET) =    42.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.85
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.32
  PIPE TRAVEL TIME(MIN.) =   0.14    Tc(MIN.) =    5.98
  LONGEST FLOWPATH FROM NODE    117.00 TO NODE    122.00 =     298.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
```

```
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.878
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8311
  SUBAREA AREA(ACRES) =    0.38   SUBAREA RUNOFF(CFS) =    1.90
  TOTAL AREA(ACRES) =        1.1   TOTAL RUNOFF(CFS) =       5.18
  TC(MIN.) =    5.98

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    123.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   190.57  DOWNSTREAM(FEET) =   189.94
  FLOW LENGTH(FEET) =   103.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  11.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.35
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.18
  PIPE TRAVEL TIME(MIN.) =   0.32    Tc(MIN.) =    6.30
  LONGEST FLOWPATH FROM NODE    117.00 TO NODE    123.00 =     401.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    123.00 TO NODE    123.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.732
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8358
  SUBAREA AREA(ACRES) =    0.35   SUBAREA RUNOFF(CFS) =    1.71
  TOTAL AREA(ACRES) =        1.4   TOTAL RUNOFF(CFS) =       6.76
  TC(MIN.) =    6.30

****************************************************************************
  FLOW PROCESS FROM NODE    123.00 TO NODE    124.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   189.94  DOWNSTREAM(FEET) =   189.73
  FLOW LENGTH(FEET) =    33.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.91
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.76
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    6.39
  LONGEST FLOWPATH FROM NODE    117.00 TO NODE    124.00 =     434.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    124.00 TO NODE    124.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.690
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
```

```
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8375
 SUBAREA AREA(ACRES) =    0.19   SUBAREA RUNOFF(CFS) =    0.92
 TOTAL AREA(ACRES) =        1.6   TOTAL RUNOFF(CFS) =       7.62
 TC(MIN.) =    6.39

****************************************************************************
 FLOW PROCESS FROM NODE    124.00 TO NODE    125.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  1289.73  DOWNSTREAM(FEET) =   189.06
 FLOW LENGTH(FEET) =    47.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN   6.0 INCH PIPE IS   2.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 131.47
 ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       7.62
 PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =    6.40
 LONGEST FLOWPATH FROM NODE    117.00 TO NODE    125.00 =     481.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    125.00 TO NODE    125.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.687
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8383
 SUBAREA AREA(ACRES) =    0.11   SUBAREA RUNOFF(CFS) =    0.53
 TOTAL AREA(ACRES) =        1.7   TOTAL RUNOFF(CFS) =       8.15
 TC(MIN.) =    6.40

****************************************************************************
 FLOW PROCESS FROM NODE    125.00 TO NODE    126.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   188.73  DOWNSTREAM(FEET) =   188.68
 FLOW LENGTH(FEET) =    73.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   2.65
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       8.15
 PIPE TRAVEL TIME(MIN.) =   0.46    Tc(MIN.) =    6.86
 LONGEST FLOWPATH FROM NODE    117.00 TO NODE    126.00 =     554.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    126.00 TO NODE    126.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.477
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8393
 SUBAREA AREA(ACRES) =    0.16   SUBAREA RUNOFF(CFS) =    0.74
 TOTAL AREA(ACRES) =        1.9   TOTAL RUNOFF(CFS) =       8.60
 TC(MIN.) =    6.86
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    126.00 TO NODE    127.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   188.68  DOWNSTREAM(FEET) =   188.02
  FLOW LENGTH(FEET) =   110.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.02
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.60
  PIPE TRAVEL TIME(MIN.) =   0.30    Tc(MIN.) =    7.16
  LONGEST FLOWPATH FROM NODE    117.00 TO NODE    127.00 =     664.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    127.00 TO NODE    127.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.338
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8401
  SUBAREA AREA(ACRES) =    0.16   SUBAREA RUNOFF(CFS) =    0.73
  TOTAL AREA(ACRES) =        2.0   TOTAL RUNOFF(CFS) =       9.10
  TC(MIN.) =    7.16

****************************************************************************
  FLOW PROCESS FROM NODE    127.00 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) =   187.69  DOWNSTREAM(FEET) =   187.44
  FLOW LENGTH(FEET) =    42.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  14.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.02
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.10
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =    7.28
  LONGEST FLOWPATH FROM NODE    117.00 TO NODE    128.00 =     706.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    128.00 TO NODE    128.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.286
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8410
  SUBAREA AREA(ACRES) =    0.20   SUBAREA RUNOFF(CFS) =    0.90
  TOTAL AREA(ACRES) =        2.2   TOTAL RUNOFF(CFS) =       9.91
  TC(MIN.) =    7.28

****************************************************************************
  FLOW PROCESS FROM NODE    128.00 TO NODE    129.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   187.44  DOWNSTREAM(FEET) =   186.51
  FLOW LENGTH(FEET) =   155.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.36
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.91
  PIPE TRAVEL TIME(MIN.) =   0.41    Tc(MIN.) =    7.68
  LONGEST FLOWPATH FROM NODE    117.00 TO NODE    129.00 =     861.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    129.00 TO NODE    129.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.100
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8423
  SUBAREA AREA(ACRES) =    0.37   SUBAREA RUNOFF(CFS) =    1.60
  TOTAL AREA(ACRES) =        2.6   TOTAL RUNOFF(CFS) =      11.17
  TC(MIN.) =    7.68

****************************************************************************
  FLOW PROCESS FROM NODE    129.00 TO NODE    130.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   186.51  DOWNSTREAM(FEET) =   186.10
  FLOW LENGTH(FEET) =    67.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.57
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.17
  PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =    7.85
  LONGEST FLOWPATH FROM NODE    117.00 TO NODE    130.00 =     928.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    131.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   185.77  DOWNSTREAM(FEET) =   185.12
  FLOW LENGTH(FEET) =   108.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.52
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.17
  PIPE TRAVEL TIME(MIN.) =   0.28    Tc(MIN.) =    8.13
  LONGEST FLOWPATH FROM NODE    117.00 TO NODE    131.00 =    1036.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    131.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.897
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
```

```
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8442
  SUBAREA AREA(ACRES) =    0.84   SUBAREA RUNOFF(CFS) =    3.50
  TOTAL AREA(ACRES) =        3.4   TOTAL RUNOFF(CFS) =      14.22
  TC(MIN.) =    8.13

****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    116.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   185.12  DOWNSTREAM(FEET) =   184.49
  FLOW LENGTH(FEET) =   105.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  14.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.96
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      14.22
  PIPE TRAVEL TIME(MIN.) =   0.25    Tc(MIN.) =    8.38
  LONGEST FLOWPATH FROM NODE    117.00 TO NODE    116.00 =    1141.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    116.00 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       14.22     8.38        4.783         3.44
  LONGEST FLOWPATH FROM NODE    117.00 TO NODE    116.00 =    1141.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF       Tc       INTENSITY     AREA
  NUMBER       (CFS)    (MIN.)    (INCH/HOUR)    (ACRE)
      1       19.48     8.23        4.850         4.81
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    116.00 =    1158.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc       INTENSITY
  NUMBER     (CFS)     (MIN.)    (INCH/HOUR)
      1      33.45       8.23        4.850
      2      33.43       8.38        4.783

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      33.45   Tc(MIN.) =    8.23
  TOTAL AREA(ACRES) =        8.2

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 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) =   183.11  DOWNSTREAM(FEET) =   182.75
  FLOW LENGTH(FEET) =    19.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  18.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.97
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      33.45
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    8.26
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    132.00 =    1177.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    133.00 TO NODE    134.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   182.75  DOWNSTREAM(FEET) =   179.95
  FLOW LENGTH(FEET) =    28.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  24.40
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      33.45
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    8.28
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    134.00 =    1205.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    134.00 TO NODE    135.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   179.62  DOWNSTREAM(FEET) =   178.40
  FLOW LENGTH(FEET) =   203.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  22.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.46
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      33.45
  PIPE TRAVEL TIME(MIN.) =   0.40    Tc(MIN.) =    8.68
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    135.00 =    1408.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    135.00 TO NODE    136.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   144.80  DOWNSTREAM(FEET) =   143.67
  FLOW LENGTH(FEET) =    76.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  17.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.06
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      33.45
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    8.78
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    136.00 =    1484.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    136.00 TO NODE    136.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.600
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8288
  SUBAREA AREA(ACRES) =    0.25   SUBAREA RUNOFF(CFS) =    0.69
  TOTAL AREA(ACRES) =        8.5   TOTAL RUNOFF(CFS) =      33.45
  TC(MIN.) =    8.78
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
```

```
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
================================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    196.50
  DOWNSTREAM ELEVATION(FEET) =    192.61
  ELEVATION DIFFERENCE(FEET) =      3.89
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.861
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.323
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.86
  TOTAL AREA(ACRES) =      0.16   TOTAL RUNOFF(CFS) =      0.86

********************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  61
--------------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
================================================================================
  UPSTREAM ELEVATION(FEET) =  192.61  DOWNSTREAM ELEVATION(FEET) =  149.11
  STREET LENGTH(FEET) =   718.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 36.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.015
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.015

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.015
  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) =       3.35
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.27
    HALFSTREET FLOOD WIDTH(FEET) =    9.16
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.45
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.21
  STREET FLOW TRAVEL TIME(MIN.) =   2.69   Tc(MIN.) =    5.55
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.071
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.798
  SUBAREA AREA(ACRES) =    1.03      SUBAREA RUNOFF(CFS) =    4.94
  TOTAL AREA(ACRES) =        1.2        PEAK FLOW RATE(CFS) =       5.77

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.31   HALFSTREET FLOOD WIDTH(FEET) =  11.64
  FLOW VELOCITY(FEET/SEC.) =  5.06   DEPTH*VELOCITY(FT*FT/SEC.) =   1.56
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     818.00 FEET.
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.2  TC(MIN.) =      5.55
  PEAK FLOW RATE(CFS)   =       5.77
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

100-YEAR POST-PROJECT CONDITION - DETAINED

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2016 Advanced Engineering Software (aes)
              Ver. 23.0 Release Date: 07/01/2016  License ID 1452

                              Analysis prepared by:




----------------------------------------------------------------------------
  FILE NAME: 3690D100.DAT
  TIME/DATE OF STUDY: 09:19 05/20/2022
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  9
   1)   5.000;  6.323
   2)  10.000;  4.044
   3)  15.000;  3.113
   4)  20.000;  2.586
   5)  25.000;  2.239
   6)  30.000;  1.991
   7)  40.000;  1.654
   8)  50.000;  1.432
   9)  60.000;  1.273
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *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 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 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):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    194.20
```

```
 DOWNSTREAM ELEVATION(FEET) =    193.70
 ELEVATION DIFFERENCE(FEET) =      0.50
 URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.182
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.323
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.21
 TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.21

****************************************************************************
 FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    193.70  DOWNSTREAM(FEET) =    192.50
 CHANNEL LENGTH THRU SUBAREA(FEET) =   118.00   CHANNEL SLOPE =  0.0102
 CHANNEL BASE(FEET) =   50.00   "Z" FACTOR =  50.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.072
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.10
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.83
 AVERAGE FLOW DEPTH(FEET) =   0.03   TRAVEL TIME(MIN.) =   2.37
 Tc(MIN.) =    5.55
 SUBAREA AREA(ACRES) =     0.34       SUBAREA RUNOFF(CFS) =    1.75
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
 TOTAL AREA(ACRES) =        0.4         PEAK FLOW RATE(CFS) =       1.96

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.04   FLOW VELOCITY(FEET/SEC.) =   1.07
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     168.00 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) =   192.50  DOWNSTREAM(FEET) =   191.30
 FLOW LENGTH(FEET) =    29.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   8.79
 ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       1.96
 PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    5.60
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =     197.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.047
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
 SUBAREA AREA(ACRES) =    0.20   SUBAREA RUNOFF(CFS) =    1.03
 TOTAL AREA(ACRES) =        0.6   TOTAL RUNOFF(CFS) =       2.98
 TC(MIN.) =    5.60
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   190.97  DOWNSTREAM(FEET) =   190.35
  FLOW LENGTH(FEET) =   103.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   9.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.61
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.98
  PIPE TRAVEL TIME(MIN.) =   0.37    Tc(MIN.) =    5.98
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =     300.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.877
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
  SUBAREA AREA(ACRES) =    0.38   SUBAREA RUNOFF(CFS) =    1.90
  TOTAL AREA(ACRES) =        1.0   TOTAL RUNOFF(CFS) =       4.80
  TC(MIN.) =    5.98

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   190.35  DOWNSTREAM(FEET) =   190.05
  FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.26
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.80
  PIPE TRAVEL TIME(MIN.) =   0.16    Tc(MIN.) =    6.14
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =     350.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.805
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
  SUBAREA AREA(ACRES) =    0.20   SUBAREA RUNOFF(CFS) =    0.99
  TOTAL AREA(ACRES) =        1.2   TOTAL RUNOFF(CFS) =       5.72
  TC(MIN.) =    6.14

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   190.05  DOWNSTREAM(FEET) =   189.72
  FLOW LENGTH(FEET) =    54.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  12.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.40
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.72
  PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =    6.30
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =     404.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.729
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
  SUBAREA AREA(ACRES) =    0.41   SUBAREA RUNOFF(CFS) =    2.00
  TOTAL AREA(ACRES) =        1.6   TOTAL RUNOFF(CFS) =       7.65
  TC(MIN.) =    6.30

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    107.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   189.72  DOWNSTREAM(FEET) =   189.30
  FLOW LENGTH(FEET) =    70.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.91
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.65
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =    6.50
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    107.00 =     474.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.639
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
  SUBAREA AREA(ACRES) =    0.14   SUBAREA RUNOFF(CFS) =    0.67
  TOTAL AREA(ACRES) =        1.7   TOTAL RUNOFF(CFS) =       8.20
  TC(MIN.) =    6.50

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.639
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8036
```

```
  SUBAREA AREA(ACRES) =    0.39   SUBAREA RUNOFF(CFS) =    1.32
  TOTAL AREA(ACRES) =        2.1   TOTAL RUNOFF(CFS) =       9.52
  TC(MIN.) =    6.50

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    108.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   188.97  DOWNSTREAM(FEET) =   188.35
  FLOW LENGTH(FEET) =   102.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  12.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.34
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.52
  PIPE TRAVEL TIME(MIN.) =   0.27    Tc(MIN.) =    6.77
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    108.00 =     576.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    108.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.517
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8061
  SUBAREA AREA(ACRES) =    0.12   SUBAREA RUNOFF(CFS) =    0.56
  TOTAL AREA(ACRES) =        2.2   TOTAL RUNOFF(CFS) =       9.87
  TC(MIN.) =    6.77

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    109.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   188.02  DOWNSTREAM(FEET) =   187.46
  FLOW LENGTH(FEET) =    94.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.34
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.87
  PIPE TRAVEL TIME(MIN.) =   0.25    Tc(MIN.) =    7.02
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    109.00 =     670.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    109.00 TO NODE    109.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.404
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8083
  SUBAREA AREA(ACRES) =    0.12   SUBAREA RUNOFF(CFS) =    0.55
  TOTAL AREA(ACRES) =        2.3   TOTAL RUNOFF(CFS) =      10.22
  TC(MIN.) =    7.02

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

```
 FLOW PROCESS FROM NODE    109.00 TO NODE    110.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   187.13  DOWNSTREAM(FEET) =   186.57
 FLOW LENGTH(FEET) =    94.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.38
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      10.22
 PIPE TRAVEL TIME(MIN.) =   0.25    Tc(MIN.) =    7.26
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    110.00 =     764.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.293
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8102
 SUBAREA AREA(ACRES) =    0.11   SUBAREA RUNOFF(CFS) =    0.49
 TOTAL AREA(ACRES) =        2.4   TOTAL RUNOFF(CFS) =      10.51
 TC(MIN.) =    7.26

****************************************************************************
 FLOW PROCESS FROM NODE    110.00 TO NODE    111.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   186.24  DOWNSTREAM(FEET) =   185.50
 FLOW LENGTH(FEET) =   106.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  12.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.83
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      10.51
 PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =    7.52
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    111.00 =     870.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    111.00 TO NODE    111.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.175
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8112
 SUBAREA AREA(ACRES) =    0.06   SUBAREA RUNOFF(CFS) =    0.26
 TOTAL AREA(ACRES) =        2.5   TOTAL RUNOFF(CFS) =      10.54
 TC(MIN.) =    7.52

****************************************************************************
 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) =   185.17  DOWNSTREAM(FEET) =   184.87
 FLOW LENGTH(FEET) =    49.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.50
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      10.54
 PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    7.64
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    112.00 =     919.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    112.00 TO NODE    112.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.117
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8152
 SUBAREA AREA(ACRES) =    0.29   SUBAREA RUNOFF(CFS) =    1.26
 TOTAL AREA(ACRES) =        2.8   TOTAL RUNOFF(CFS) =      11.68
 TC(MIN.) =    7.64

****************************************************************************
 FLOW PROCESS FROM NODE    112.00 TO NODE    113.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   184.87  DOWNSTREAM(FEET) =   184.25
 FLOW LENGTH(FEET) =   104.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.55
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      11.68
 PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =    7.91
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    113.00 =    1023.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    113.00 TO NODE    113.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.997
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8182
 SUBAREA AREA(ACRES) =    0.27   SUBAREA RUNOFF(CFS) =    1.15
 TOTAL AREA(ACRES) =        3.1   TOTAL RUNOFF(CFS) =      12.55
 TC(MIN.) =    7.91

****************************************************************************
 FLOW PROCESS FROM NODE    113.00 TO NODE    114.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   184.25  DOWNSTREAM(FEET) =   183.93
 FLOW LENGTH(FEET) =    53.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.66
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
```

```
  PIPE-FLOW(CFS) =      12.55
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    8.04
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    114.00 =    1076.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    114.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.936
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8257
  SUBAREA AREA(ACRES) =    0.94   SUBAREA RUNOFF(CFS) =    3.94
  TOTAL AREA(ACRES) =        4.0   TOTAL RUNOFF(CFS) =      16.34
  TC(MIN.) =    8.04

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    115.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   183.93  DOWNSTREAM(FEET) =   183.63
  FLOW LENGTH(FEET) =    51.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  16.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.09
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      16.34
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =    8.16
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    115.00 =    1127.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    115.00 TO NODE    115.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.882
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8297
  SUBAREA AREA(ACRES) =    0.80   SUBAREA RUNOFF(CFS) =    3.32
  TOTAL AREA(ACRES) =        4.8   TOTAL RUNOFF(CFS) =      19.48
  TC(MIN.) =    8.16

****************************************************************************
  FLOW PROCESS FROM NODE    115.00 TO NODE    116.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   183.63  DOWNSTREAM(FEET) =   183.44
  FLOW LENGTH(FEET) =    31.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  18.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.39
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      19.48
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    8.23
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    116.00 =    1158.00 FEET.

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

```
  FLOW PROCESS FROM NODE    116.00 TO NODE    116.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    117.00 TO NODE    118.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =    194.20
  DOWNSTREAM ELEVATION(FEET) =    193.70
  ELEVATION DIFFERENCE(FEET) =      0.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.182
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.323
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.21
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.21

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    119.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    193.70  DOWNSTREAM(FEET) =    192.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   118.00   CHANNEL SLOPE =  0.0102
  CHANNEL BASE(FEET) =   50.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.072
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.10
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.83
  AVERAGE FLOW DEPTH(FEET) =   0.03   TRAVEL TIME(MIN.) =   2.37
  Tc(MIN.) =    5.55
  SUBAREA AREA(ACRES) =     0.34       SUBAREA RUNOFF(CFS) =    1.75
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.850
  TOTAL AREA(ACRES) =        0.4         PEAK FLOW RATE(CFS) =       1.96

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.04   FLOW VELOCITY(FEET/SEC.) =   1.07
  LONGEST FLOWPATH FROM NODE    117.00 TO NODE    119.00 =     168.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    119.00 TO NODE    120.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   192.50  DOWNSTREAM(FEET) =   191.51
  FLOW LENGTH(FEET) =    29.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.20
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.96
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    5.61
  LONGEST FLOWPATH FROM NODE    117.00 TO NODE    120.00 =     197.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.045
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8065
  SUBAREA AREA(ACRES) =    0.08   SUBAREA RUNOFF(CFS) =    0.29
  TOTAL AREA(ACRES) =        0.5   TOTAL RUNOFF(CFS) =       2.24
  TC(MIN.) =    5.61

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    121.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   191.18  DOWNSTREAM(FEET) =   190.82
  FLOW LENGTH(FEET) =    59.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.42
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.24
  PIPE TRAVEL TIME(MIN.) =   0.22    Tc(MIN.) =    5.83
  LONGEST FLOWPATH FROM NODE    117.00 TO NODE    121.00 =     256.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    121.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.944
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8206
  SUBAREA AREA(ACRES) =    0.22   SUBAREA RUNOFF(CFS) =    1.11
  TOTAL AREA(ACRES) =        0.7   TOTAL RUNOFF(CFS) =       3.32
  TC(MIN.) =    5.83

****************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   190.82  DOWNSTREAM(FEET) =   190.57
  FLOW LENGTH(FEET) =    42.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.85
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.32
  PIPE TRAVEL TIME(MIN.) =   0.14    Tc(MIN.) =    5.98
  LONGEST FLOWPATH FROM NODE    117.00 TO NODE    122.00 =     298.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
```

```
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.878
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8311
  SUBAREA AREA(ACRES) =    0.38   SUBAREA RUNOFF(CFS) =    1.90
  TOTAL AREA(ACRES) =        1.1   TOTAL RUNOFF(CFS) =       5.18
  TC(MIN.) =    5.98

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    123.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   190.57  DOWNSTREAM(FEET) =   189.94
  FLOW LENGTH(FEET) =   103.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  11.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.35
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.18
  PIPE TRAVEL TIME(MIN.) =   0.32    Tc(MIN.) =    6.30
  LONGEST FLOWPATH FROM NODE    117.00 TO NODE    123.00 =     401.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    123.00 TO NODE    123.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.732
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8358
  SUBAREA AREA(ACRES) =    0.35   SUBAREA RUNOFF(CFS) =    1.71
  TOTAL AREA(ACRES) =        1.4   TOTAL RUNOFF(CFS) =       6.76
  TC(MIN.) =    6.30

****************************************************************************
  FLOW PROCESS FROM NODE    123.00 TO NODE    124.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   189.94  DOWNSTREAM(FEET) =   189.73
  FLOW LENGTH(FEET) =    33.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.91
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.76
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    6.39
  LONGEST FLOWPATH FROM NODE    117.00 TO NODE    124.00 =     434.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    124.00 TO NODE    124.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.690
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
```

```
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8375
 SUBAREA AREA(ACRES) =    0.19   SUBAREA RUNOFF(CFS) =    0.92
 TOTAL AREA(ACRES) =        1.6   TOTAL RUNOFF(CFS) =       7.62
 TC(MIN.) =    6.39

****************************************************************************
 FLOW PROCESS FROM NODE    124.00 TO NODE    125.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  1289.73  DOWNSTREAM(FEET) =   189.06
 FLOW LENGTH(FEET) =    47.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN   6.0 INCH PIPE IS   2.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 131.47
 ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       7.62
 PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =    6.40
 LONGEST FLOWPATH FROM NODE    117.00 TO NODE    125.00 =     481.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    125.00 TO NODE    125.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.687
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8383
 SUBAREA AREA(ACRES) =    0.11   SUBAREA RUNOFF(CFS) =    0.53
 TOTAL AREA(ACRES) =        1.7   TOTAL RUNOFF(CFS) =       8.15
 TC(MIN.) =    6.40

****************************************************************************
 FLOW PROCESS FROM NODE    125.00 TO NODE    126.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   188.73  DOWNSTREAM(FEET) =   188.68
 FLOW LENGTH(FEET) =    73.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   2.65
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       8.15
 PIPE TRAVEL TIME(MIN.) =   0.46    Tc(MIN.) =    6.86
 LONGEST FLOWPATH FROM NODE    117.00 TO NODE    126.00 =     554.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    126.00 TO NODE    126.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.477
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8393
 SUBAREA AREA(ACRES) =    0.16   SUBAREA RUNOFF(CFS) =    0.74
 TOTAL AREA(ACRES) =        1.9   TOTAL RUNOFF(CFS) =       8.60
 TC(MIN.) =    6.86
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    126.00 TO NODE    127.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   188.68  DOWNSTREAM(FEET) =   188.02
  FLOW LENGTH(FEET) =   110.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.02
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.60
  PIPE TRAVEL TIME(MIN.) =   0.30    Tc(MIN.) =    7.16
  LONGEST FLOWPATH FROM NODE    117.00 TO NODE    127.00 =     664.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    127.00 TO NODE    127.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.338
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8401
  SUBAREA AREA(ACRES) =    0.16   SUBAREA RUNOFF(CFS) =    0.73
  TOTAL AREA(ACRES) =        2.0   TOTAL RUNOFF(CFS) =       9.10
  TC(MIN.) =    7.16

****************************************************************************
  FLOW PROCESS FROM NODE    127.00 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) =   187.69  DOWNSTREAM(FEET) =   187.44
  FLOW LENGTH(FEET) =    42.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  14.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.02
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.10
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =    7.28
  LONGEST FLOWPATH FROM NODE    117.00 TO NODE    128.00 =     706.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    128.00 TO NODE    128.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.286
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8410
  SUBAREA AREA(ACRES) =    0.20   SUBAREA RUNOFF(CFS) =    0.90
  TOTAL AREA(ACRES) =        2.2   TOTAL RUNOFF(CFS) =       9.91
  TC(MIN.) =    7.28

****************************************************************************
  FLOW PROCESS FROM NODE    128.00 TO NODE    129.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   187.44  DOWNSTREAM(FEET) =   186.51
  FLOW LENGTH(FEET) =   155.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.36
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.91
  PIPE TRAVEL TIME(MIN.) =   0.41    Tc(MIN.) =    7.68
  LONGEST FLOWPATH FROM NODE    117.00 TO NODE    129.00 =     861.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    129.00 TO NODE    129.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.100
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8423
  SUBAREA AREA(ACRES) =    0.37   SUBAREA RUNOFF(CFS) =    1.60
  TOTAL AREA(ACRES) =        2.6   TOTAL RUNOFF(CFS) =      11.17
  TC(MIN.) =    7.68

****************************************************************************
  FLOW PROCESS FROM NODE    129.00 TO NODE    130.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   186.51  DOWNSTREAM(FEET) =   186.10
  FLOW LENGTH(FEET) =    67.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.57
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.17
  PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =    7.85
  LONGEST FLOWPATH FROM NODE    117.00 TO NODE    130.00 =     928.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    131.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   185.77  DOWNSTREAM(FEET) =   185.12
  FLOW LENGTH(FEET) =   108.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.52
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.17
  PIPE TRAVEL TIME(MIN.) =   0.28    Tc(MIN.) =    8.13
  LONGEST FLOWPATH FROM NODE    117.00 TO NODE    131.00 =    1036.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    131.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.897
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
```

```
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8442
  SUBAREA AREA(ACRES) =    0.84   SUBAREA RUNOFF(CFS) =    3.50
  TOTAL AREA(ACRES) =        3.4   TOTAL RUNOFF(CFS) =      14.22
  TC(MIN.) =    8.13

****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    116.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   185.12  DOWNSTREAM(FEET) =   184.49
  FLOW LENGTH(FEET) =   105.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  14.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.96
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      14.22
  PIPE TRAVEL TIME(MIN.) =   0.25    Tc(MIN.) =    8.38
  LONGEST FLOWPATH FROM NODE    117.00 TO NODE    116.00 =    1141.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    116.00 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       14.22     8.38        4.783         3.44
  LONGEST FLOWPATH FROM NODE    117.00 TO NODE    116.00 =    1141.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF       Tc       INTENSITY     AREA
  NUMBER       (CFS)    (MIN.)    (INCH/HOUR)    (ACRE)
      1       19.48     8.23        4.850         4.81
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    116.00 =    1158.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc       INTENSITY
  NUMBER     (CFS)     (MIN.)    (INCH/HOUR)
      1      33.45       8.23        4.850
      2      33.43       8.38        4.783

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      33.45   Tc(MIN.) =    8.23
  TOTAL AREA(ACRES) =        8.2

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 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) =   183.11  DOWNSTREAM(FEET) =   182.75
  FLOW LENGTH(FEET) =    19.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  18.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.97
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      33.45
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    8.26
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    132.00 =    1177.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    133.00 TO NODE    133.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  19.00   RAIN INTENSITY(INCH/HOUR) =  2.69
  TOTAL AREA(ACRES) =     8.27   TOTAL RUNOFF(CFS) =      6.99

****************************************************************************
  FLOW PROCESS FROM NODE    133.00 TO NODE    134.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   182.75  DOWNSTREAM(FEET) =   179.95
  FLOW LENGTH(FEET) =    28.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.82
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.99
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =   19.03
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    134.00 =    1205.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    134.00 TO NODE    135.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   179.62  DOWNSTREAM(FEET) =   178.40
  FLOW LENGTH(FEET) =   203.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.82
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.99
  PIPE TRAVEL TIME(MIN.) =   0.58    Tc(MIN.) =   19.61
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    135.00 =    1408.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    135.00 TO NODE    136.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   144.80  DOWNSTREAM(FEET) =   143.67
  FLOW LENGTH(FEET) =    76.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.16
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.99
  PIPE TRAVEL TIME(MIN.) =   0.16    Tc(MIN.) =   19.76
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    136.00 =    1484.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    136.00 TO NODE    136.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.611
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =   0
```

```
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3224
  SUBAREA AREA(ACRES) =    0.25   SUBAREA RUNOFF(CFS) =    0.39
  TOTAL AREA(ACRES) =        8.5   TOTAL RUNOFF(CFS) =       7.17
  TC(MIN.) =   19.76

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    196.50
  DOWNSTREAM ELEVATION(FEET) =    192.61
  ELEVATION DIFFERENCE(FEET) =      3.89
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.861
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.323
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.86
  TOTAL AREA(ACRES) =      0.16   TOTAL RUNOFF(CFS) =      0.86

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  192.61  DOWNSTREAM ELEVATION(FEET) =  149.11
  STREET LENGTH(FEET) =   718.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 36.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.015
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.015

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.015
  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) =       3.35
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.27
    HALFSTREET FLOOD WIDTH(FEET) =    9.16
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.45
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.21
  STREET FLOW TRAVEL TIME(MIN.) =   2.69   Tc(MIN.) =    5.55
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.071
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.798
  SUBAREA AREA(ACRES) =    1.03      SUBAREA RUNOFF(CFS) =    4.94
  TOTAL AREA(ACRES) =        1.2        PEAK FLOW RATE(CFS) =       5.77

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.31   HALFSTREET FLOOD WIDTH(FEET) =  11.64
  FLOW VELOCITY(FEET/SEC.) =  5.06   DEPTH*VELOCITY(FT*FT/SEC.) =   1.56
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     818.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
```

```
  TOTAL AREA(ACRES)      =         1.2  TC(MIN.) =      5.55
  PEAK FLOW RATE(CFS)    =        5.77
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

Appendix 5

Modified-Puls Detention Routing

RATIONAL METHOD HYDROGRAPH PROGRAM
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RUN DATE 5/20/2022
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 10 MIN.
6 HOUR RAINFALL 2.4 INCHES
BASIN AREA 8.27 ACRES
RUNOFF COEFFICIENT 0.85
PEAK DISCHARGE 33.45 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 10	DISCHARGE (CFS) = 1
TIME (MIN) = 20	DISCHARGE (CFS) = 1
TIME (MIN) = 30	DISCHARGE (CFS) = 1.1
TIME (MIN) = 40	DISCHARGE (CFS) = 1.1
TIME (MIN) = 50	DISCHARGE (CFS) = 1.1
TIME (MIN) = 60	DISCHARGE (CFS) = 1.2
TIME (MIN) = 70	DISCHARGE (CFS) = 1.2
TIME (MIN) = 80	DISCHARGE (CFS) = 1.2
TIME (MIN) = 90	DISCHARGE (CFS) = 1.3
TIME (MIN) = 100	DISCHARGE (CFS) = 1.4
TIME (MIN) = 110	DISCHARGE (CFS) = 1.4
TIME (MIN) = 120	DISCHARGE (CFS) = 1.5
TIME (MIN) = 130	DISCHARGE (CFS) = 1.6
TIME (MIN) = 140	DISCHARGE (CFS) = 1.7
TIME (MIN) = 150	DISCHARGE (CFS) = 1.8
TIME (MIN) = 160	DISCHARGE (CFS) = 1.9
TIME (MIN) = 170	DISCHARGE (CFS) = 2.1
TIME (MIN) = 180	DISCHARGE (CFS) = 2.2
TIME (MIN) = 190	DISCHARGE (CFS) = 2.5
TIME (MIN) = 200	DISCHARGE (CFS) = 2.8
TIME (MIN) = 210	DISCHARGE (CFS) = 3.4
TIME (MIN) = 220	DISCHARGE (CFS) = 3.8
TIME (MIN) = 230	DISCHARGE (CFS) = 5.6
TIME (MIN) = 240	DISCHARGE (CFS) = 2.9
TIME (MIN) = 250	DISCHARGE (CFS) = 33.45
TIME (MIN) = 260	DISCHARGE (CFS) = 4.5
TIME (MIN) = 270	DISCHARGE (CFS) = 3
TIME (MIN) = 280	DISCHARGE (CFS) = 2.4
TIME (MIN) = 290	DISCHARGE (CFS) = 2
TIME (MIN) = 300	DISCHARGE (CFS) = 1.7
TIME (MIN) = 310	DISCHARGE (CFS) = 1.5
TIME (MIN) = 320	DISCHARGE (CFS) = 1.4
TIME (MIN) = 330	DISCHARGE (CFS) = 1.3
TIME (MIN) = 340	DISCHARGE (CFS) = 1.2
TIME (MIN) = 350	DISCHARGE (CFS) = 1.1
TIME (MIN) = 360	DISCHARGE (CFS) = 1
TIME (MIN) = 370	DISCHARGE (CFS) = 0

Outlet Structure for Discharge of BMP-1

Discharge vs. Elevation Table

Low-flow orifice			Slot orifice			Emergency Overflow		
No.:	1		No.:	1		Invert:	5.5	ft
Invert:	0	ft	Invert:	2.00	ft	L:	14	ft
Dia:	4	in	Length:	2.75	ft	C_w:	3.1	
Dia:	0.33	ft	Height	0.25	ft	Tank Dimensions		
A:	0.087	sq.ft.	A:	0.69	sq.ft	Area:	5,971	sq.ft.
C_o:	0.6		C_o:	0.6		Height:	6	ft
						Total Vol:	35,824	cu.ft.

***Note: h = head above the invert of the lowest surface discharge opening.**

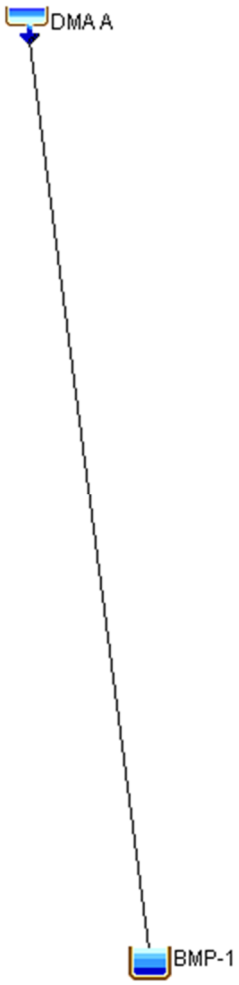
Elev (ft)	h* (ft)	Volume (ac-ft)	$Q_{orifice-low}$ (cfs)	$Q_{slot-mid}$ (cfs)	Q_{emerg} (cfs)	Q_{total} (cfs)
182.75	0.00	0.0000	0.0000	0.000	0.000	0.0000
183.00	0.25	0.0343	0.1292	0.000	0.000	0.1292
183.25	0.50	0.0685	0.2712	0.000	0.000	0.2712
183.50	0.75	0.1028	0.3431	0.000	0.000	0.3431
183.75	1.00	0.1371	0.4023	0.000	0.000	0.4023
184.00	1.25	0.1713	0.4539	0.000	0.000	0.4539
184.25	1.50	0.2056	0.5001	0.000	0.000	0.5001
184.50	1.75	0.2399	0.5425	0.000	0.000	0.5425
184.75	2.00	0.2741	0.5817	0.000	0.000	0.5817
185.00	2.25	0.3084	0.6185	1.433	0.000	2.0519
185.25	2.50	0.3427	0.6532	2.190	0.000	2.8428
185.50	2.75	0.3769	0.6862	2.745	0.000	3.4309
185.75	3.00	0.4112	0.7176	3.205	0.000	3.9228
186.00	3.25	0.4455	0.7477	3.607	0.000	4.3550
186.25	3.50	0.4797	0.7767	3.969	0.000	4.7456
186.50	3.75	0.5140	0.8046	4.300	0.000	5.1048
186.75	4.00	0.5483	0.8316	4.608	0.000	5.4393
187.00	4.25	0.5825	0.8577	4.896	0.000	5.7537
187.25	4.50	0.6168	0.8831	5.168	0.000	6.0513
187.50	4.75	0.6511	0.9077	5.427	0.000	6.3345
187.75	5.00	0.6853	0.9317	5.674	0.000	6.6053
188.00	5.25	0.7196	0.9551	5.910	0.000	6.8652
188.25	5.50	0.7539	0.9779	6.137	0.000	7.1154
188.50	5.75	0.7881	1.0002	6.357	5.425	12.7820
188.75	6.00	0.8224	1.0221	6.569	15.344	22.9350

Note:

1. Weir equation, $Q=C_wL_e(h)^{3/2}$
2. Orifice equation, $Q=C_oA_e(2gh)^{1/2}$
3. Slot orifice acts as a weir when h* < h_{slot}; slot orifice acts as an orifice when h* ≥ h_{slot}

HEC-HMS Detention Routing Summary

Project Shinohara



Summary Results for Reservoir "BMP-1"

Project: Shinohara Simulation Run: Q100
Reservoir: BMP-1

Start of Run:	01Jan2000, 00:00	Basin Model:	Post_Dev
End of Run:	01Jan2000, 06:05	Meteorologic Model:	Met 1
Compute Time:	DATA CHANGED, RECOMPUTE	Control Specifications:	Control 1

Volume Units: (•) IN ( ) ACRE-FT

Computed Results

Peak Inflow:	33.45 (CFS)	Date/Time of Peak Inflow:	01Jan2000, 04:10
Peak Discharge:	6.99 (CFS)	Date/Time of Peak Discharge:	01Jan2000, 04:19
Inflow Volume:	n/a	Peak Storage:	0.74 (ACRE-FT)
Discharge Volume:	n/a	Peak Elevation:	5.37 (FT)

Observed Flow Gage BMP 1

Peak Discharge:	33.45 (CFS)	Date/Time of Peak Discharge:	01Jan2000, 04:10
Volume:	n/a		
RMSE Std Dev:	0.93	Nash-Sutcliffe:	0.126
Percent Bias:	-22.43 %		

