Appendix I-1
Drainage Study

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PRELIMINARY DRAINAGE STUDY

As part of the:

WARNER AVENUE FROM MAIN STREET TO GRAND AVENUE WIDENING PROJECT

Located in:

THE CITY OF SANTA ANA, CALIFORNIA

Prepared For:
The City of Santa Ana
P.O. Box 1988
Santa Ana, CA 92702
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APRIL 8, 2013

DOCUMENT CONTROL

Client:	THE PLANNING CENTER
Project Name:	WARNER AVENUE FROM MAIN STREET TO GRAND AVENUE WIDENING PROJECT
Report Title:	Preliminary DRAINAGE STUDY
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Originator:	COREY J. MELLOR CPM
Reviewer:	BILL DELO AICP
Authorization:	[Name]
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History:	

TABLE OF CONTENTS

1. PROJECT BACKGROUND

The project area is located in the City of Santa Ana in Orange County, CA. The study area consists of approximately 1 mile of proposed street widening along Warner Avenue between Main Street and Grand Avenue. The existing road right of way varies in width from 70' to 120'. Proposed improvements will widen the street to a 110' right of way from Main Street to Standard Avenue. Between Standard Avenue and Grand Avenue, the right of way width will vary from 106' to 110'.

The properties lining the project corridor include a mixture of residential, commercial, and industrial, with longitudinal grades along the street typically running between 0.2% to 0.5% draining towards the south and west. Storm drain piping conveys runoff to the existing Orange County Flood Control District (OCFCD) Facility F01 (See Appendix A for Drainage Maps of Existing Conditions along Warner Avenue). Soils on the site are Group C, being silty-loamy soils with fine texture and slow infiltration rates (see Appendix D for Soils Map). Based on the FEMA Flood Maps (See Appendix F), this area is not located in any recorded flood plain.

Data on existing drainage conditions have been gathered from a previous drainage study performed by Boyle Engineering in 1993 (See Appendix I). Using this data to make assumptions for offsite flows to Warner Avenue, effects of the proposed onsite improvements were studied using Orange County Flood control Districts' recommended software Advanced Engineering Software's (AES) hydrology-hydraulic modeling program. Improvements to this project area will have a negligible impact to the amount of impervious areas of the adjacent drainage basins (the 136.8 acres of onsite drainage per Boyle's 1993 study), and will increase the street's volume capacity to carry storm runoff. The proposed street widening also offers an opportunity to evaluate the existing storm drain system and upgrade the system to provide adequate capacity.

The existing storm drain infrastructure beginning at the east end of the project consists of a 7x6 concrete box that runs from Grand Avenue to the railroad tracks and then continues north paralleling the tracks. To the west a new line begins at Standard Avenue with a 27" RCP which continues to Rouselle Street where a large diameter pipe connects to the Warner Avenue system. Here the pipe size changes to 60" and continues west to Main Street.

2. HYDROLOGY

The method for evaluating the site hydrology follows the format set forth in the Orange County Local Drainage Manual (January 1996). For tributary areas of less than 640 acres, the 10-year storm is used to evaluate storm drains at continuous grade below the top of curb. In sump conditions, the 25-year storm would be used for determining the capacity of catch basins and connecting storm drains. As no sump conditions exist along Warner Avenue between Main Street and Grand Avenue, there was no need to perform the analysis for the 25-year storm event.

Design criteria, as described in the Local Drainage Manual, requires that one 12-foot travel lane in an arterial street remains clear in each direction for traffic ability, using the 10-year storm for streets at continuous grade. As this stretch of Warner Avenue is at continuous grade, only the 10-year storm event was used. In order to calculate street flow capacity, three typical cross-sections were used (see Appendix G for Cross-Section Details of the 106- and 110- foot Right of Way Street Widths). A 132 foot cross section analysis, applicable only at the intersections of Warner and Grand and Warner and Main, will follow in a subsequent phase of the street widening.

Additionally, during the 100-year storm event, 1 foot of freeboard is required between the recorded flood elevation and the lowest finished floor elevation of adjacent building structures.

AES was used for hydrologic modeling, following the Orange County standard for the Rational Method. While Land Use Maps (See Appendix C) were available for the City of Santa Ana, Boyle's study offered a more detailed breakdown of the specific development types within each sub-area. Comparing the impervious values from these two sources, it was determined that Boyle's 1993 report resulted in more conservative calculations; therefore, the acreages and development types were modeled after Boyle's report. Street improvements for the proposed condition were modeled along with the existing pipes, to determine which pipes had deficient capacity. Based on the program output (See Appendix J), recommendations for increased pipe sizes were made. These largely reflect the suggestions made by Boyle in 1993 with some minor adjustments due to updated rainfall intensities embedded within the 2008 version AES Software. (See Appendix I for Boyle's Hydrology Report and Recommendation; Summary of Recommendations are also included on the Existing Conditions Drainage Maps in Appendix A).

This hydrology analysis follows the drainage calculations completed by Boyle, using rainfall intensity graph data built into the 2008 AES' Rational Method program for Orange County. As this study is a conceptual-level exercise and focuses only on the runoff from drainage sub-areas that flow directly into Warner Avenue within the project limits, all existing offsite data is taken directly from Boyle's study. Apart from Boyle's report, no additional information was provided to re-calculate upstream runoff to the site. These offsite areas were modeled in the AES program as user-defined flows; using variables pulled from Boyle's report (see Appendix H for tables summarizing the sub-basin areas contributing to these flows). In cases where only the total runoff flow was provided, minus sufficient data available to input the required parameters for user-defined flow, an effective area was calculated that corresponds to the given flow.

For the purposes of this model, the upstream drainage area was assumed to be an "Initial Area" or starting point for the model. Due to insufficient topographic information, IBI was unable to determine a precise value for elevations at the high-end of the drainage basin. Therefore, the USGS quad map (see Appendix E) was used to determine the approximate slope and length of overland flow route to determine the initial Time of Concentration.

Antecedent Moisture Condition (AMC) II was used for this model as recommended in the Orange County Hydrology Manual for the 10- year design.

3. HYDRAULICS

This preliminary drainage study follows the requirements of the Orange County Local Drainage Manual (January 1996). Per Orange County requirements, the Hydraulic Grade Line (HGL) within catch basins must be at least 0.5 feet below the street gutter. As this study is conceptual and some lateral/catch basin invert elevation information was not available, inlet hydraulics were not considered; therefore, the design criteria for Hydraulic Grade Line (HGL) of the conveyance is assumed to be at least two feet below the street gutter grade. Additional constraints, per the Local Drainage Manual, dictate that depth of water at the curb (feet) x velocity (fps) cannot exceed 6 fps for storms up to a 25-year frequency. Based on the HGL calculations completed, both of these criteria have been exceeded.

AES (v. 2008) was used for hydraulic modeling of mainlines, and the Pipeflow component of the Hydrosoft Package was used to determine the HGL.

Since no previous hydraulic calculations were provided with the drainage study done by Boyle, the hydraulics were modeled for the existing pipe systems flows from the revised hydrology completed as part of this study to depict the current systems' deficient capacity. Output data for both models are included in Appendix K and the table below.

Pipe Reach	Capacity Needed (cfs)	Existing Capacity (cfs)	Recommended Upgrade	Upgrade Capacity (cfs)
4705 - 4706	355.41	591.70	No Upgrade	
4706 - 4707	396.89	295.20	11'x6.5' RCB	481.00
3826 - 3834	128.72	13.90	66" Pipe	164.35
3834 - 3845	145.85	13.90	66" Pipe	160.89
3845 - 3805	189.36	13.90	72" Pipe	227.91
3805 - 3733	1110.73	116.70	11' x 8' RCB	1141.97
3733 - 3739	1123.07	169.50	11' x 8' RCB	1208.03
3739 - 3745	1150.36	169.50	11' x 9' RCB	1327.15
3745 - 3746	1167.79	169.50	13' x 9' RCB	1310.51
3746 - 3746	1167.79	169.50	13' x 9' RCB	1310.51

No survey information was available to indicate invert elevations and slopes, therefore all storm drain data came from as-builts and existing reports. Flow line elevations were not provided for the laterals at catch basins and the mainline; therefore, assumptions were made in order to calculate inlet hydraulics at catch basins and laterals in order to finally calculate RCB sizes. Additional assumptions were made to determine junction losses where these laterals connected to the main line. AES software does not model Reinforced Concrete Boxes, so these were modeled using an alternative, but approved software method. Detailed invert and as-built information at intersections with more than one catch basin was limited. Therefore, IBI was unable to determine which portion of a drainage sub-basin was discharged into a specific inlet.

4. PRELIMINARY CONSTRUCTION COST ESTIMATE

Planning level cost estimates for drainage modifications were prepared to address both the recommendations within this report regarding the necessary upsizing of existing facilities to accommodate projected design year flows as well as those physically required to accommodate the proposed widening.

Table 4.1 provides a breakdown of the estimated costs for the recommended upgrades to the existing storm drain facilities along Warner within the project limits needed to accommodate projected design year flows. The estimate in Table 4.1 does not include any upstream or downstream improvements outside the project limits that may also be needed but are not part of this study. These items and costs are subject to change pending more detailed studies and analysis during future project phases.

Table 4.2 provides a breakdown of the estimated costs for all modifications and relocations to existing storm drain laterals and catch basins needed to accommodate the proposed widening as shown in the Preliminary Engineering Plans completed as part of this current phase of study. These items and costs are subject to change also as the project is in its preliminary stage. These improvements will not meet the current storm drain deficiency in this area and continued ponding/flooding will occur in most areas if this is the only modification made to the system.

*** Cost Estimates are based on the 2008 Contract Cost Data book published by the California Department of Transportation.**

Table 4.1

Storm Drain System Upgrade Costs

Quantity	Unit	Item	Unit Cost	Amount
11675	CY	Excavation & Backfill	$10.00	$116,750.00
485	LF	Install 13' x 9' R.C. Box Culvert	$745.00	$361,325.00
372	LF	Install 11' x 9' R.C. Box Culvert	$625.00	$232,500.00
510	LF	Install 11' x 8' R.C. Box Culvert	$595.00	$303,450.00
158	LF	Install 11’ x 6.5’ R.C. Box Culvert	$550.00	$86,900.00
1150	LF	Install 72" R.C.P.	$200.00	$230,000.00
1000	LF	Install 66" R.C.P.	$175.00	$175,000.00
3550	LF	Removal of Existing Pipe	$25.00	$88,750.00
1	EA	Remove Junction Box	$1,245.00	$1,245.00
			Sub-Total:	$1,595,920.00
			**15% Cont:	$239,388.00
			Total:	**$1,835,308.00**

**(15% Contingency Covers any Junction and Catch Basin amenities.)

Table 4.2

Storm Drain Costs- Widening Only

Quantity	Unit	Item	Unit Cost	Amount
378	LF	Install 18" R.C.P.	$200.00	$75,600.00
56	LF	Install 30” R.C.P	$150.00	$8,400.00
37	LF	Install 60” R.C.P	$200.00	$7,400.00
1	EA	Install 7' Catch Basin	$5,500.00	$5,500.00
5	EA	Install 14' Catch Basin	$8,000.00	$40,000.00
2	EA	Install 21' Catch Basin	$10,000.00	$20,000.00
8	EA	Remove Catch Basin	$1,000.00	$8,000.00
378	LF	Remove Existing RCP Pipe	$25.00	$9,450.00
			***Total**	**$174,350.00**

5.

SUMMARY AND CONCLUSIONS

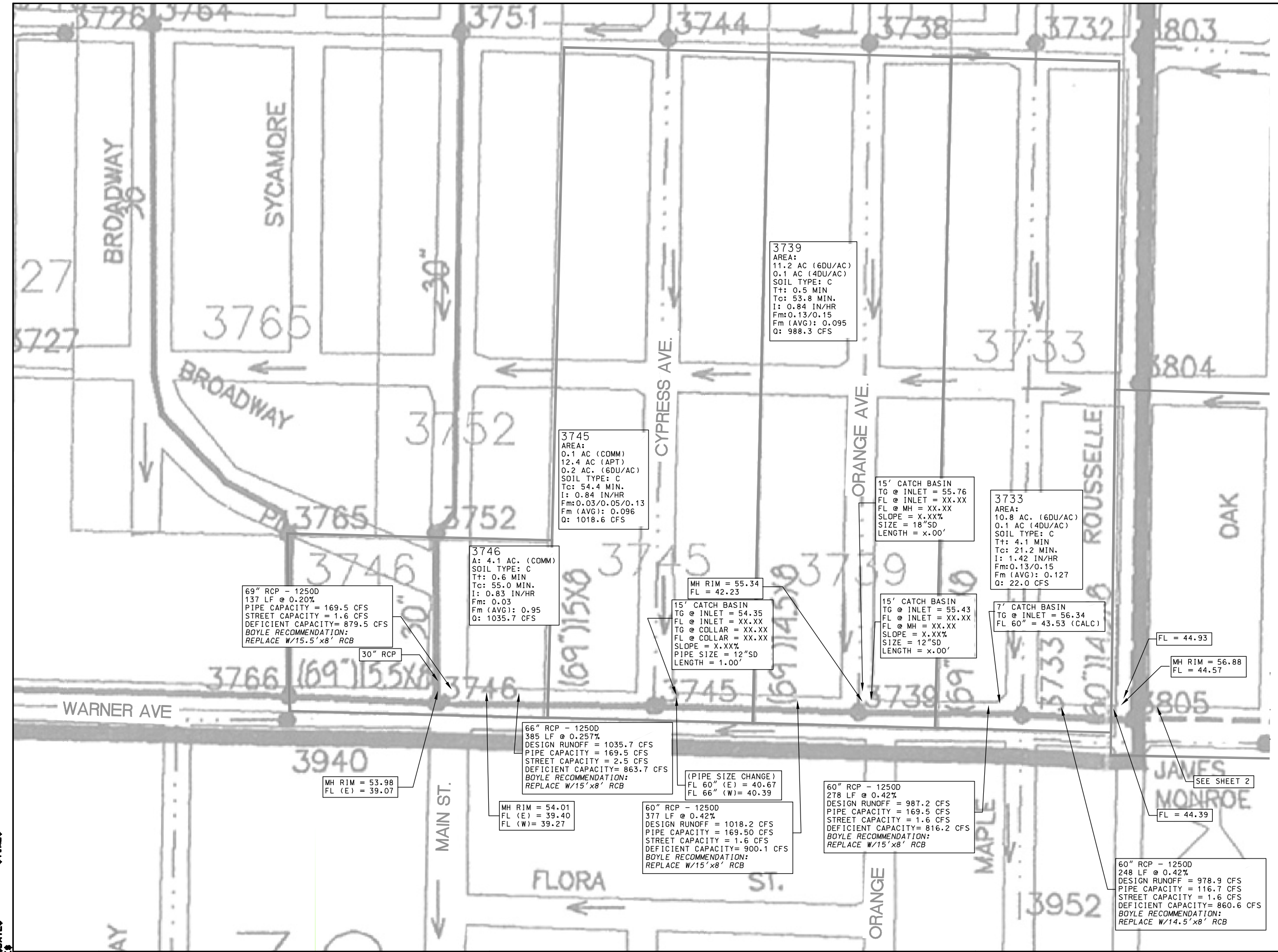
The results from Boyle's drainage study demonstrate that, at the time of the report in 1993, most piping along Warner Avenue lacked sufficient capacity to handle the runoff based on the rainfall intensity graphs of 1993. As-builts provided by the City of Santa Ana show that, in a few cases, the existing pipes are even smaller than what was assumed in study, resulting in greater deficiencies in their capacity. Boyle made recommendations for replacement of the undersized pipes and/or provided a second option with the addition of a parallel line. Based upon review of the as-built plans for the latest major roadway improvement project through the study limits completed in 2001, the majority of these suggestions were not implemented. As a result, the existing condition is one in which there is insufficient drainage capacity to accommodate the design rainfall. Actual storm events over the last several years have generated significant flooding in the study area, justifying the conclusions of this study and the Boyle report.

Additionally, based on the Hydraulic analysis, the existing condition is one in which most pipes are currently flowing under pressure conditions.

By widening Warner Avenue, the capacity of the street to carry additional runoff increases; however, this difference in most areas is negligible and not sufficient to make up for the lack of adequate storm drain conveyance. Therefore, it is imperative that the existing storm drain system be upgraded to provide the necessary additional capacity for storm runoff as part of this widening project. Recommended upgrades to the pipe system are shown in Appendix B. Hydraulic calculations show that, with these suggested improvements, the HGL will meet the City's requirement. Recommended upgrades to the system will be extensive in order to meet flow capacity and mitigate the current flood conditions currently taking place.

The basic drainage pattern for the area begins in the northeast and flows towards the southwest. The purpose of this preliminary study was to assess the impacts to the existing storm drain system associated with the proposed widening along Warner Avenue between Main Street and Grand Avenue. As such, this drainage report was not intended to determine whether or not there is a need to upsize additional upstream or downstream pipes outside of the project limits. The upstream and downstream areas will need to be completed in order to adequately size the needed drainage system.

APPENDIX A: HYDROLOGY/SITE MAPS – EXISTING CONDITIONS



LEGEND

- 0369 — ANALYSIS NODE
- STORM FLOW PATH
- 36" — EXISTING STORM DRAIN
- 8X10 — EXISTING RCB STORM DRAIN
- 10'X5' — EXISTING OPEN CHANNEL
- EXISTING OPEN CHANNEL
- 0369 — DRAINAGE AREA BOUNDARY
- 1 — BASIN BOUNDARY
- CITY BOUNDARY

PROPOSED IMPROVEMENTS

- 48" — NEW STORM DRAIN
- 24"/48" — PARALLEL STORM DRAIN
- (24") 48" — REPLACEMENT STORM DRAIN

1-1-11

N

0 100 200 300

SCALE: 1"=100'

NOTE:
ALL HYDROLOGY INFORMATION AS PER BOYLE ENGINEERING REPORT (1993) - SEE APPENDIX H. STORM DRAIN INFORMATION PER ASBUILTS PROVIDED BY THE CITY OF SANTA ANA

IBI GROUP

PROJECT NO. 25683

User: $USERNAME$
Date Plotted: $DATE$ $TIME$
Filename: $FILE$

FILE NO.

REVISIONS				
NUMBER	DATE	INITIALS	DESCRIPTIONS	APPRVD

REFERENCES	
PLANS	BENCH MARK # OCS BM :SA-242-70 ELEV. 58.162' (NAVD88)
	YEAR LEVELED 1992. FOUND 3 3/4" OCS ALUMINUM BENCHMARK DISK STAMPED
	"SA-242-70". SET IN THE NW CORNER OF A 3.5' X 19.5' CONCRETE CATCH
	BASIN. MONUMENT IS LOCATED IN THE NE CORNER OF THE INTERSECTION OF
	HALLADAY ST AND WARNER AVE. 85.5' N OF THE CL OF WARNER AVE AND
	21.3' E OF HALLADAY ST. MONUMENT IS SET LEVEL WITH THE SIDEWALK.

PREPARED UNDER THE SUPERVISION OF — DATE

R.C.E. NO. 42697

DESIGNED	JSILVER	DRAWN	JSILVER
R/W APPROVED		CHECKED	CMELLOR
RECOMMENDED			

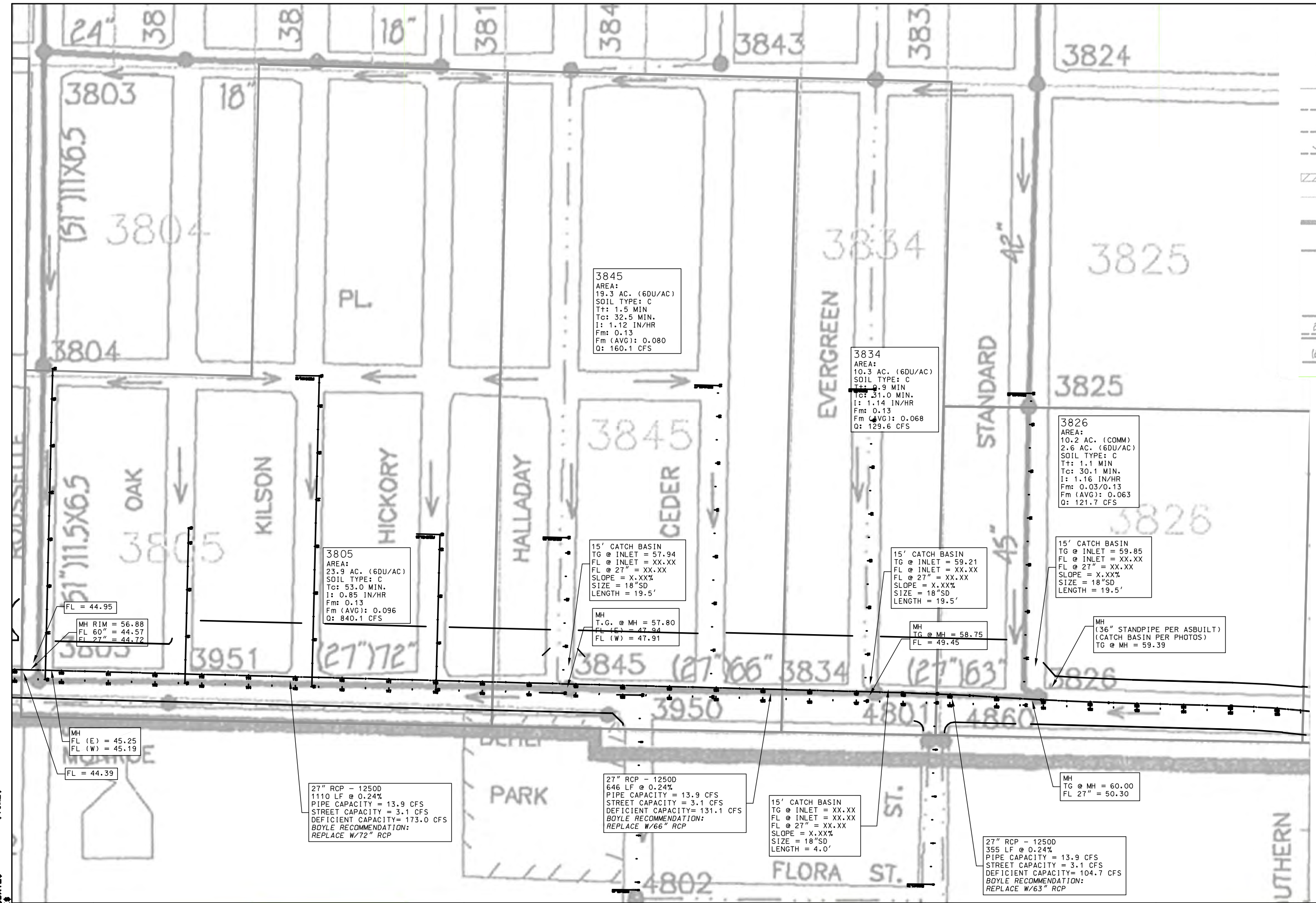
SENIOR CIVIL ENGINEER — R.C.E. NO. 36060

EXISTING DRAINAGE CONDITIONS

WARNER AVENUE

FROM MAIN STREET TO GRAND AVENUE
INCLUDING BOYLE REPORT RECOMMENDATIONS

PUBLIC WORKS AGENCY
CITY OF SANTA ANA



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1-1-12

0 100 200 300

SCALE: 1"=100'

NOTE:
ALL HYDROLOGY INFORMATION AS PER BOYLE ENGINEERING REPORT (1993) - SEE APPENDIX H. STORM DRAIN INFORMATION PER ASBUILTS PROVIDED BY THE CITY OF SANTA ANA

IBI GROUP

PROJECT NO. 25683

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Filename: $FILE$

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REVISIONS				
NUMBER	DATE	INITIALS	DESCRIPTIONS	APPRVD

REFERENCES

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PREPARED UNDER THE SUPERVISION OF

R.C.E. NO.

DESIGNED JSILVER DRAWN JSILVER

R/W APPROVED CHECKED CWELLOR

RECOMMENDED

SENIOR CIVIL ENGINEER R.C.E. NO.

DATE

EXISTING DRAINAGE CONDITIONS

WARNER AVENUE

FROM MAIN STREET TO GRAND AVENUE
INCLUDING BOYLE REPORT RECOMMENDATIONS

PUBLIC WORKS AGENCY
CITY OF SANTA ANA

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4704 18" 4722 18" 4721 48" 4738

SANTA FE ST. HATHAWAY ST. 4721 4738 ST.

4739 4739 4749 WRIGHT

4705 MAYWOOD AV. 4706 4707 4748 RITCHE

WARNER 84"/139" 4749 4885

4880

8'X6.25'

3'x6.25' RCB @ 0.26%

19' CATCH BASIN W/ 18" SD LATERAL TG @ INLET = 62.56 FL @ RCB = 51.75

4705
AREA:
9.5 AC. (COMM.)
SOIL TYPE: C
T+: 1.7 MIN
Tc: 27.5 MIN.
I: 1.23 IN/HR
Fm:0.03
Fm (AVG): 0.031
Q: 342.1 CFS

CATCH BASIN TG @ INLET = 62.99

7' CATCH BASIN W/ 18" SD LATERAL TG @ INLET = 62.92 FL @ RCB = 50.30

4706
AREA:
5.9 AC. (COMM.)
SOIL TYPE: C
T+: 1.5 MIN
Tc: 29.1 MIN.
I: 1.19 IN/HR
Fm:0.03
Fm (AVG): 0.031
Q: 342.1 CFS

MH
TG @ MH = 63.23
FL 18"(S) = 50.30
FL 7'X6' = 49.79

8'x6' RCB @ 0.36%
PIPE CAPACITY = 591.7 CFS
BOYLE RECOMMENDATION:
NO IMPROVEMENT NECESSARY

60" RCP - 1400D
375 L.F. @ 0.20%

G.B.
FL = 49.58

60" RCP - 1400D
142 L.F. @ 0.96%

60" RCP - 1400D
62 L.F. @ 0.96%

CATCH BASIN
TG @ INLET = 64.31

JS
TG @ JS = 65.1
FL 60"(N) = 47.61
FL 10'X8'(S) = 47.15
FL 84"(E) = 47.8
FL 7'X6'(W) = 47.56

18' CATCH BASIN W/ 18" SD LATERAL TG @ INLET = 65.06

7'x6' RCB @ 0.10%
PIPE CAPACITY = 295.20 CFS
BOYLE RECOMMENDATION:
51" RCP

18' CATCH BASIN W/ 8 LF - 18" RCP TG @ INLET = 64.73

84" RCP - 1050D
529 LF @ 0.20%
PIPE CAPACITY = 286.3 CFS
STREET CAPACITY = 25.1 CFS
DEFICIENT CAPACITY = 38.5
BOYLE RECOMMENDATION:
INSTALL 39" PARALLEL LINE

10'x8' RCB @ 0.236%

4707
AREA:
16.1 AC. (COMM)
SOIL TYPE: C
T+: 0.4 MIN
Tc: 29.5 MIN.
I: 1.18 IN/HR
Fm: 0.03
Fm (AVG): 0.30
Q: 342.1 CFS

4749
AREA:
Q: 349.9 CFS

84" RCP - 1050D
565 LF @ 0.20%

JS
TG @ JS = 63.16
FL (E) = 48.68
FL (W) = 48.67

N

0 100 200 300
SCALE: 1" =100'

NOTE:
ALL HYDROLOGY INFORMATION AS PER BOYLE ENGINEERING REPORT (1993) - SEE APPENDIX H. STORM DRAIN INFORMATION PER ASBUILTS PROVIDED BY THE CITY OF SANTA ANA

IBI GROUP

PROJECT NO.

FILE NO.

REVISIONS

NUMBER	DATE	INITIALS	DESCRIPTIONS	APPRVD

REFERENCES

PLANS

BENCH MARK # OCS BM :SA-242-70 ELEV. 58.162' (NAVD88)
YEAR LEVELED 1992. FOUND 3 3/4" OCS ALUMINUM BENCHMARK DISK STAMPED "SA-242-70". SET IN THE NW CORNER OF A 3.5' X 19.5' CONCRETE CATCH BASIN. MONUMENT IS LOCATED IN THE NE CORNER OF THE INTERSECTION OF HALLADAY ST AND WARNER AVE. 85.5' N OF THE CL OF WARNER AVE AND 21.3' E OF HALLADAY ST. MONUMENT IS SET LEVEL WITH THE SIDEWALK.

1-1-13

PREPARED UNDER THE SUPERVISION OF

R.C.E. NO.

DESIGNED JSILVER DRAWN JSILVER

R/W APPROVED CHECKED CMELLOR

RECOMMENDED

SENIOR CIVIL ENGINEER R.C.E. NO.

DATE

EXISTING DRAINAGE CONDITIONS

WARNER AVENUE

FROM MAIN STREET TO GRAND AVENUE
INCLUDING BOYLE REPORT RECOMMENDATIONS

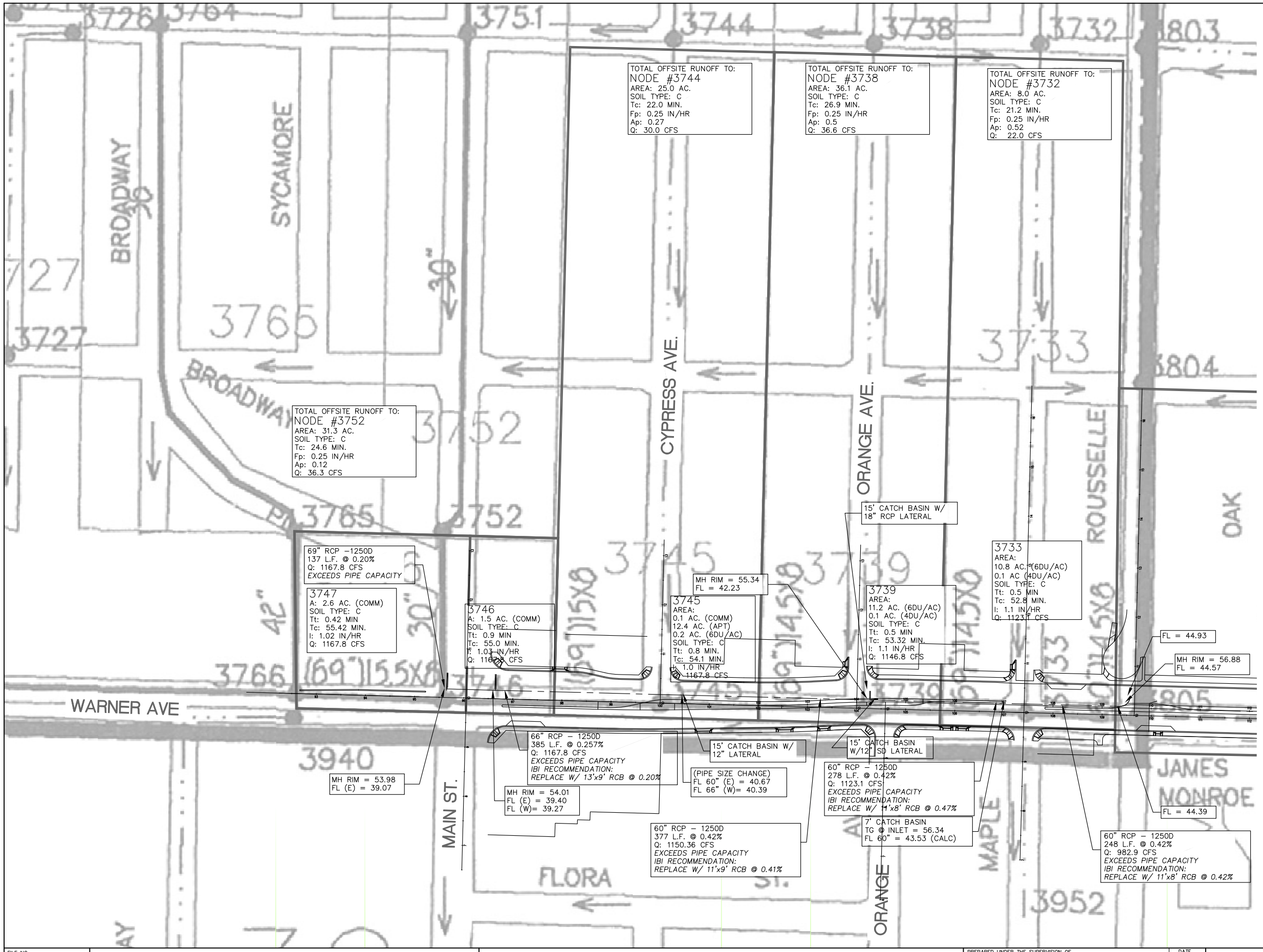
PUBLIC WORKS AGENCY
CITY OF SANTA ANA

SHEET 3 OF 131

User: $USERNAME$
Date Plotted: $DATE$ $TIME$
Filename: $FILE$

APPENDIX B: HYDROLOGY/SITE MAPS – PROPOSED CONDITIONS

Note: Appendix B Exhibits show an in progress version of the improvements proposed which reflects the current calculations of this report. Progression of improvements have not impacted this analysis.



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IBI GROUP

PROJECT NO. 25683

FILE NO.	REVISIONS					REFERENCES		PREPARED UNDER THE SUPERVISION OF		DATE
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						WATER & SEWER ATLAS: #	YEAR LEVELED 1992, FOUND 3 3/4" OCS ALUMINUM BENCHMARK DISK STAMPED	DESIGNED JSILVER	DRAWN JSILVER	00/00
							"SA-242-70", SET IN THE NW CORNER OF A 3.5' X 19.5' CONCRETE CATCH	R/W APPROVED	CHECKED CMELLOR	00/00
							BASIN. MONUMENT IS LOCATED IN THE NE CORNER OF THE INTERSECTION OF	RECOMMENDED		
							HALLADAY ST AND WARNER AVE, 85.5' N OF THE CL OF WARNER AVE AND			
							21.3' E OF HALLADAY ST. MONUMENT IS SET LEVEL WITH THE SIDEWALK.	SENIOR CIVIL ENGINEER R.C.E. NO. 36060		

PROPOSED DRAINAGE CONDITIONS

WARNER AVENUE

FROM MAIN STREET TO GRAND AVENUE

PUBLIC WORKS AGENCY
CITY OF SANTA ANA

SHEET 1 OF 13

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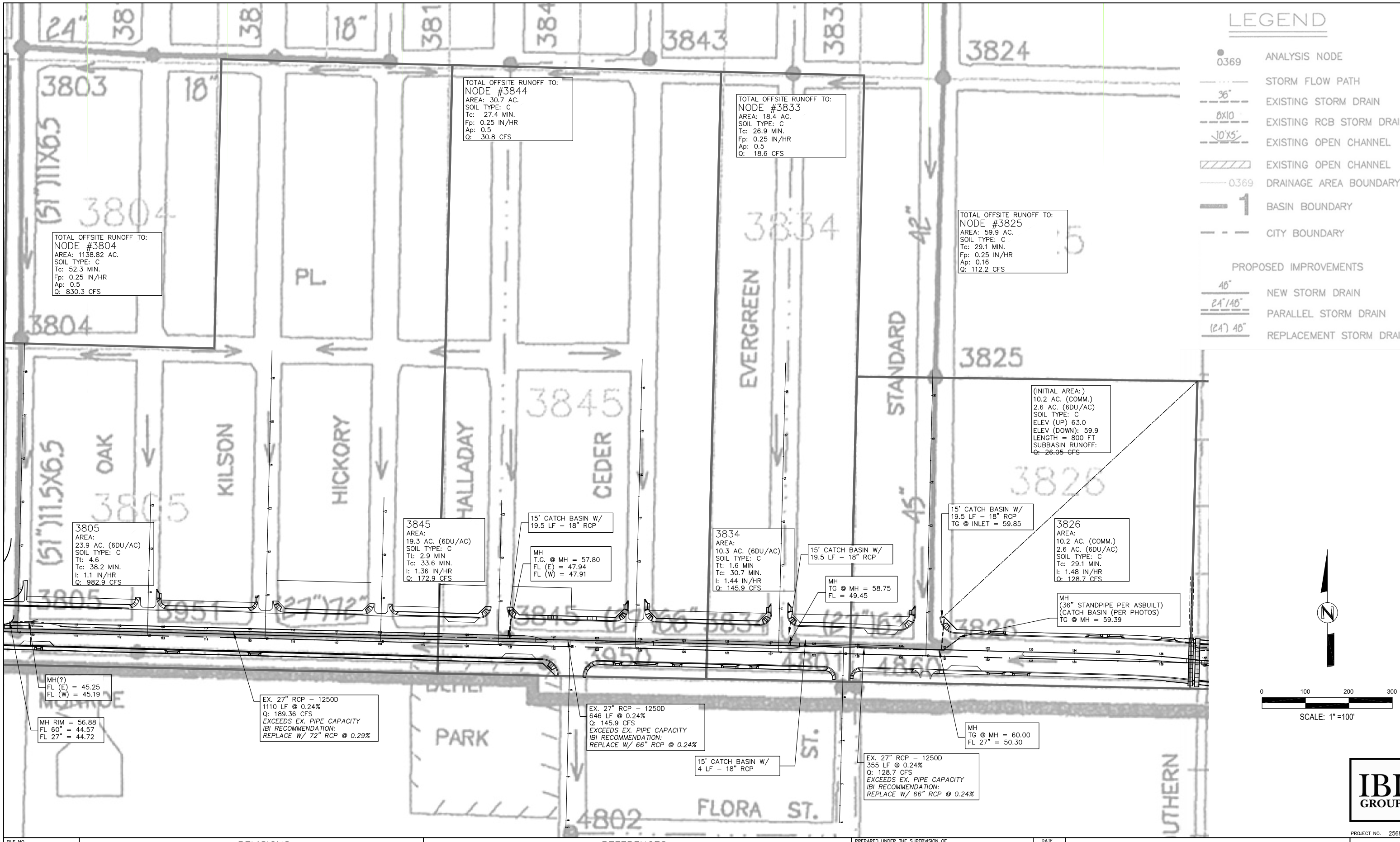

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DESIGNED JSILVER DRAWN JSILVER

R/W APPROVED CHECKED CMELLOR

RECOMMENDED

SENIOR CIVIL ENGINEER R.C.E. NO.

DATE

PROPOSED DRAINAGE MAP

WARNER AVENUE

FROM MAIN STREET TO GRAND AVENUE

PUBLIC WORKS AGENCY
CITY OF SANTA ANA

SHEET 2 OF 14

User: $USERNAME$ $TIME$
Date Plotted: $DATE$
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FILE NO.

REVISIONS				
NUMBER	DATE	INITIALS	DESCRIPTIONS	APPRVD

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	"SA-242-70", SET IN THE NW CORNER OF A 3.5' X 19.5' CONCRETE CATCH
	BASIN. MONUMENT IS LOCATED IN THE NE CORNER OF THE INTERSECTION OF
	HALLADAY ST AND WARNER AVE, 85.5' N OF THE CL OF WARNER AVE AND
	21.3' E OF HALLADAY ST. MONUMENT IS SET LEVEL WITH THE SIDEWALK.

PREPARED UNDER THE SUPERVISION OF

R.C.E. NO.

DESIGNED JSILVER DRAWN JSILVER

R/W APPROVED CHECKED CMELLOR

RECOMMENDED

SENIOR CIVIL ENGINEER R.C.E. NO.

DATE

1-1-17

PROPOSED DRAINAGE CONDITIONS

WARNER AVENUE

FROM MAIN STREET TO GRAND AVENUE

PUBLIC WORKS AGENCY
CITY OF SANTA ANA

PROJECT NO.

SHEET 3 OF 13

IBI GROUP

User: $USERNAME$
Date Plotted: $DATE$ $TIME$
Filename: $FILE$

APPENDIX C: CURRENT LAND USE PLAN

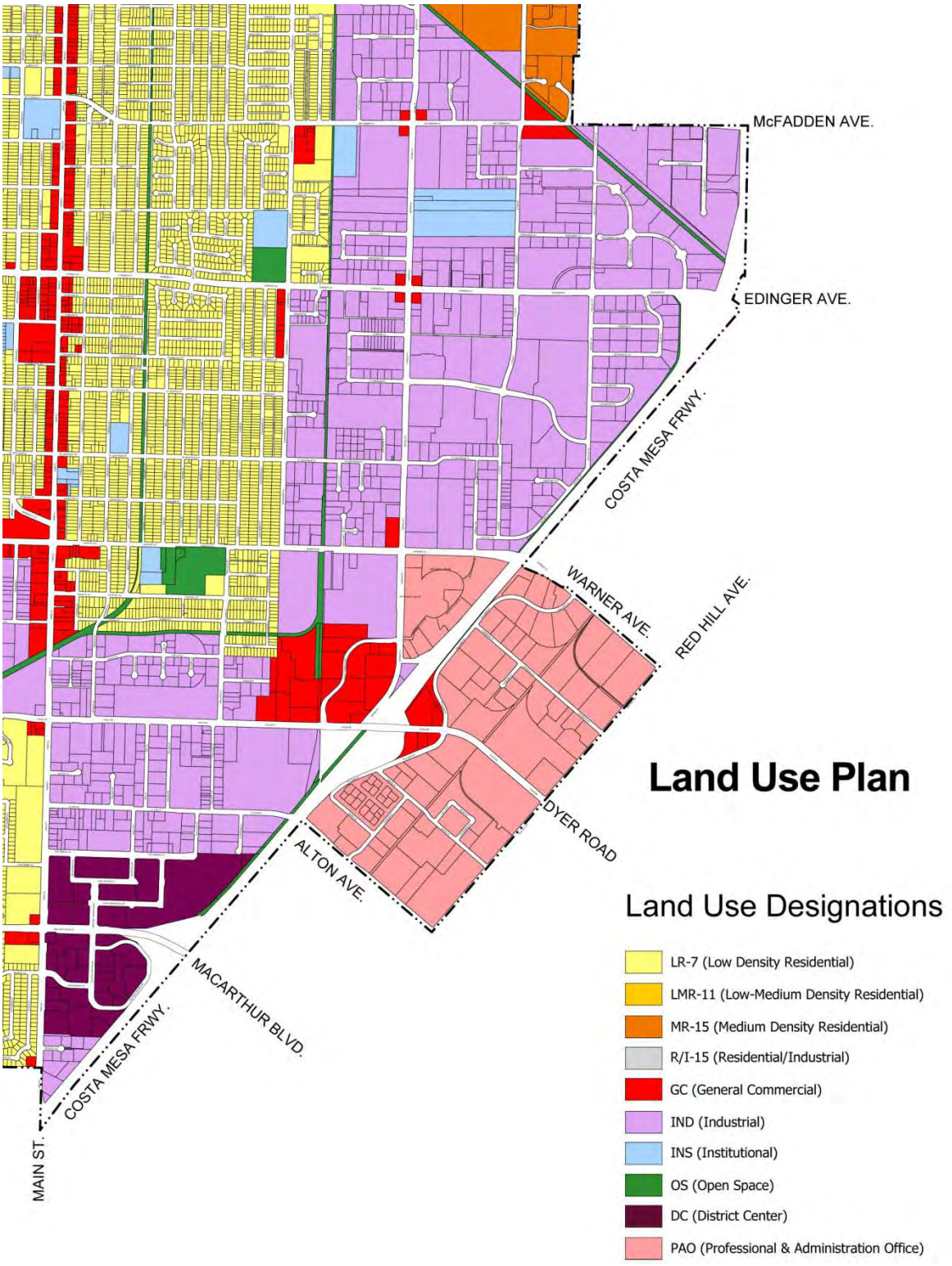


Figure 1: City of Santa Ana Plan, 2008

APPENDIX D: SOILS MAP

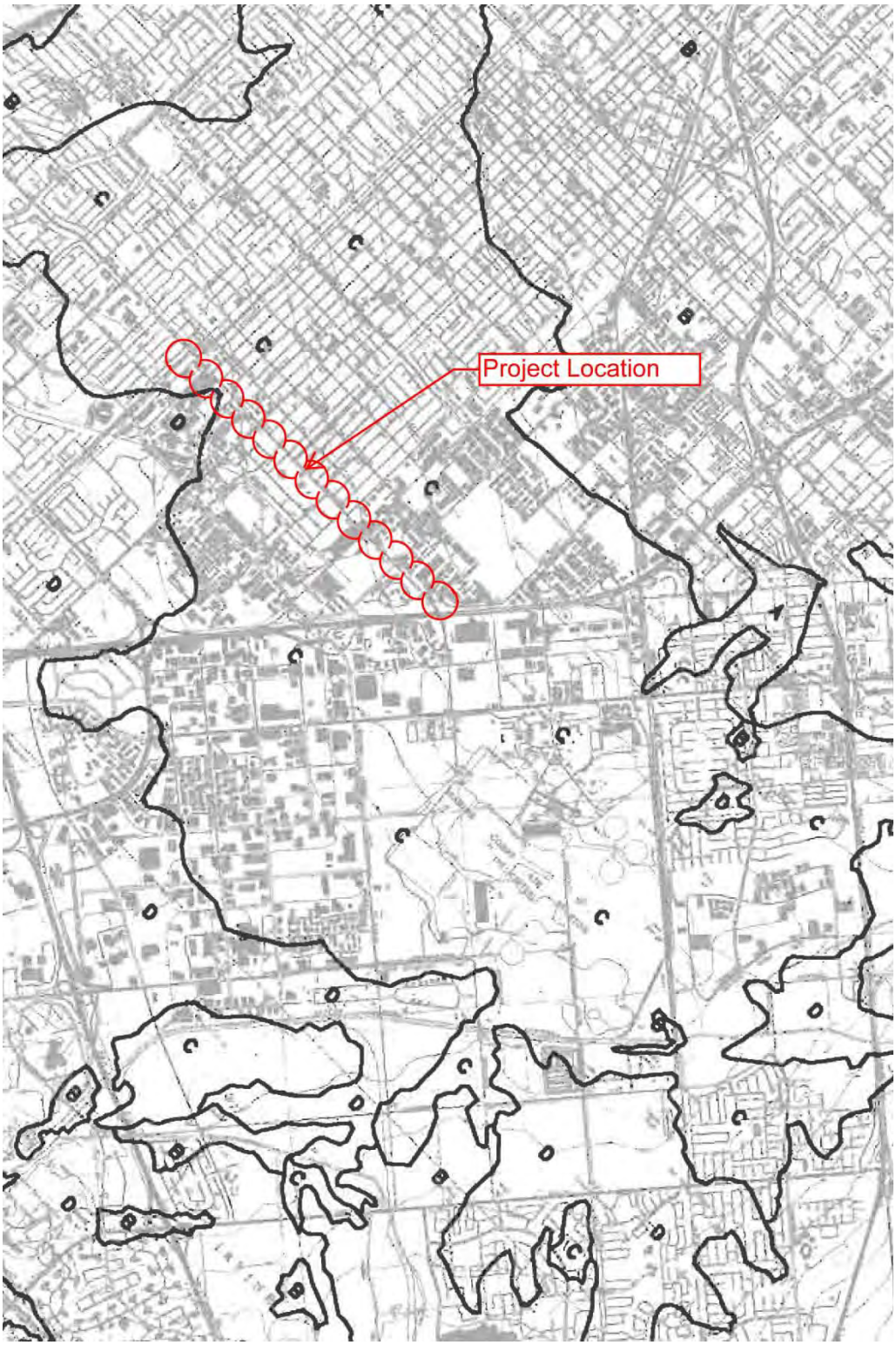


Figure 2: Hydrologic Classification of Soils (Orange County Hydrology Manual) - Plate B

APPENDIX E: USGS QUAD MAP

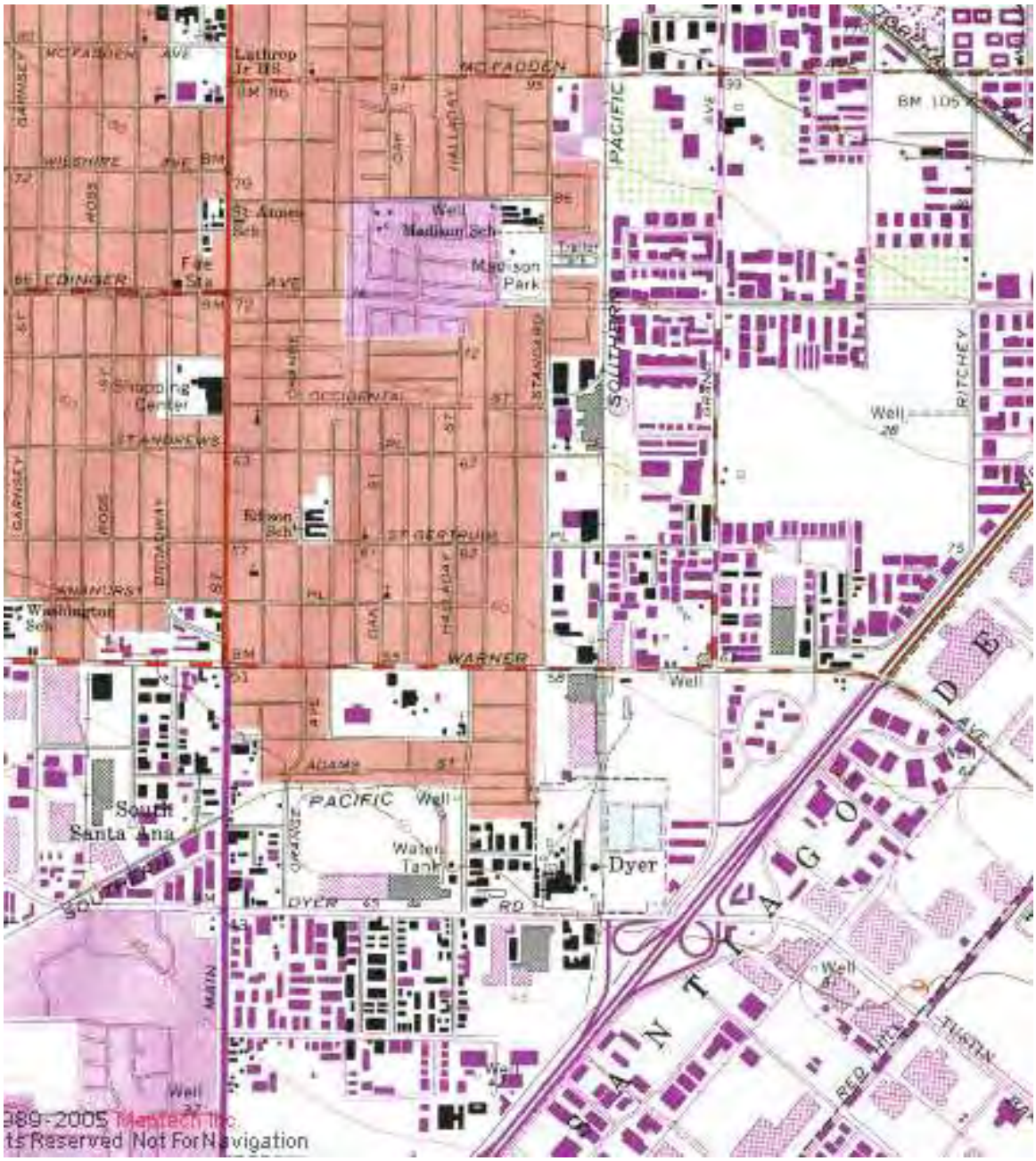


Figure 3: USGS Topo (from TerraServer)

APPENDIX F: FEMA FLOOD MAP

tional Flood Insurance Program at 1-800-638-6620.

6070000 FT

JOINS PANEL 0276

6075000 FT

MAP SCALE 1" = 500'

50 0 500 1000

FEET

METERS

BROADWAY PLACE

DX1926

CYPRESS AVENUE

ORANGE AVENUE

MAPLE STREET

ROUSSELLE STREET

OAK STREET

KILSON DRIVE

HICKORY STREET

ANAHURST PLACE

CEDAR STREET

EVERGREEN STREET

STANDARD AVENUE

UNION PACIFIC RAILROAD

HATHAWAY STREET

WARNER AVENUE

ZONE X

FLORA STREET

FLORA STREET

BROADWAY

DX1928

CYPRESS AVENUE

MEASOR STREET

CENTRAL AVENUE

NTRAL AVENUE

ADAMS STREET

City of
anta Ana
060232

HOTEL TERRACE DRIVE

GOETZ AVENUE

OAK STREET

HALLADAY STREET

YOUNG STREET

BIRTCHER DRIVE

GRAND AVENUE

DX1930

DYER ROAD

ZO

MAIN STREET

KILSON DRIVE

TECH CENTER

PULLMAN ST

ORDS LANE

GARRY AVENUE

GE AVENUE

K STREET

1% ANNUAL CHANCE
FLOOD DISCHARGE
CONTAINED IN CHANNEL

NFIP

PANEL 0278J

FIRM

FLOOD INSURANCE RATE MAP

ORANGE COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 278 OF 539

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COSTA MESA, CITY OF	060216	0278	J
IRVINE, CITY OF	060222	0278	J
ORANGE COUNTY	060212	0278	J
SANTA ANA, CITY OF	060232	0278	J
TUSTIN, CITY OF	060235	0278	J

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06059C0278J

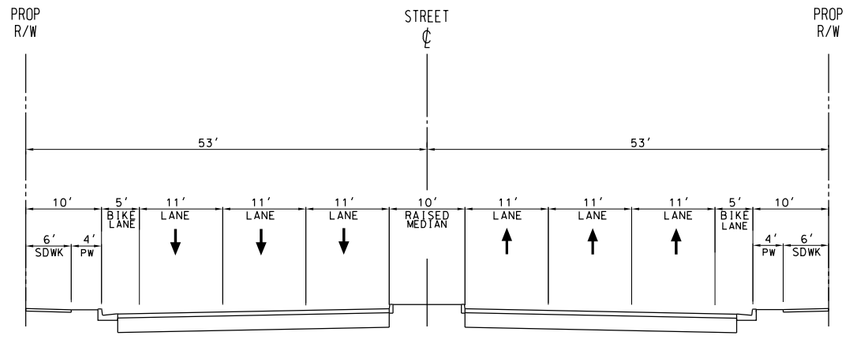
MAP REVISED
DECEMBER 3, 2009

Federal Emergency Management Agency

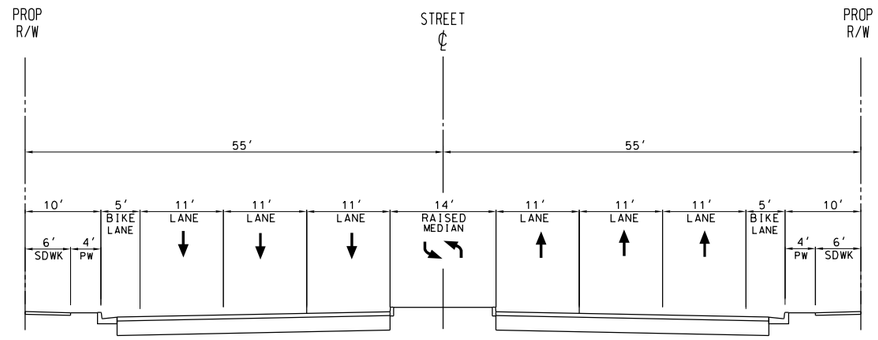
NATIONAL FLOOD INSURANCE PROGRAM

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

APPENDIX G: STREET CROSS SECTION DETAILS



TYPICAL SECTION (106' ROW)
FROM STANDARD AVENUE TO
HATHAWAY STREET



TYPICAL SECTION (110' ROW)
FROM MAIN STREET TO STANDARD AVENUE
FROM HATHAWAY STREET TO GRAND AVENUE

IBI GROUP

FILE NO.	REVISIONS				REFERENCES			PREPARED UNDER THE SUPERVISION OF	DATE	TYPICAL SECTIONS
	NUMBER	DATE	INITIALS	DESCRIPTIONS	APPRVD	PLANS	BENCH MARK #	ELEV.	R.C.E. NO.		**WARNER AVENUE WIDENING**
									DESIGNED DRAWN		MAIN ST TO GRAND AVE
									R/W APPROVED CHECKED		
									RECOMMENDED		**PUBLIC WORKS AGENCY**
							1-1-27		SENIOR CIVIL ENGINEER R.C.E. NO.		CITY OF SANTA ANA

APPENDIX H: EXISTING OFF-SITE HYDROLOGY

MAIN STREET TO STANDARD AVE:

Criteria for modeling "User Specified Hydrology Data at a Node" for AES:

Total Off-Site Flow to 3825-3826:

Areas Contributing to Flow at Node (Per 1993 Drainage Study by Boyle Engineering):		
Node	Area (Acres)	Pervious Area Fraction*
3821	8.8 (Commercial)	0.1
	0.2 (6 DU/Ac)	0.5
3822	10.7 (Commercial)	0.1
	0.3 (6 DU/Ac)	0.5
3823	7.5 (Commercial)	0.1
	2.0 (6 DU/Ac)	0.5
3824	14.1 (Commercial)	0.1
	3.9 (6 DU/Ac)	0.5
3825	9.8 (Commercial)	0.1
	2.6 (6 DU/Ac)	0.5

*From OC Hydrology Manual figure C-4: "Actual Impervious Cover for Developed Areas"

Input parameters into AES Program:
Time of Concentration: 29.1 min.
Total Area: 59.9 Ac
Effective Area: 59.9 Ac (assume it is the same as "Total Area")
Total Runoff: 12.2 cfs
Fp = 0.25 in/hr (From OC Hydrology Manual table C.2: "Maximum Effective Pervious Area Loss Rates")
Pervious Area Fraction Ap: 0.16

Total Off-Site Flow to 3833-3834:

Areas Contributing to Flow at Node (Per 1993 Drainage Study by Boyle Engineering):		
Node	Area (Acres)	Pervious Area Fraction*
3831	5.1 (6 DU/Ac)	0.5
3832	6.3 (6 DU/Ac)	0.5
3833	7.0 (6 DU/Ac)	0.5

*From OC Hydrology Manual figure C-4: "Actual Impervious Cover for Developed Areas"

Input parameters into AES Program:
Time of Concentration: 26.9 min.
Total Area: 18.4 Ac
Effective Area: 18.4 Ac (assume it is the same as "Total Area")
Total Runoff: 18.6 cfs
Fp = 0.25 in/hr (From OC Hydrology Manual table C.2: "Maximum Effective Pervious Area Loss Rates")
Pervious Area Fraction Ap: 0.5

Total Off-Site Flow to 3844-3845:

Areas Contributing to Flow at Node (Per 1993 Drainage Study by Boyle Engineering):		
Node	Area (Acres)	Pervious Area Fraction*
3841	5.4 (6 DU/Ac)	0.5
3842	10.8 (6 DU/Ac)	0.5
3843	7.8 (6 DU/Ac)	0.5
3844	6.7 (6 DU/Ac)	0.5

*From OC Hydrology Manual figure C-4: "Actual Impervious Cover for Developed Areas"

Input parameters into AES Program:
Time of Concentration: 27.4 min.
Total Area: 30.7 Ac
Effective Area: 30.7 Ac (assume it is the same as "Total Area")
Total Runoff: 30.8 cfs
Fp = 0.25 in/hr (From OC Hydrology Manual table C.2: "Maximum Effective Pervious Area Loss Rates")
Pervious Area Fraction Ap: 0.5

Total Off-Site Flow to 3804-3805:

Areas Contributing to Flow at Node (Per 1993 Drainage Study by Boyle Engineering):		
Node	Area (Acres)	Pervious Area Fraction*
3504 (From Memory Bank)	1061.12	
3811	5.9 (6 DU/Ac)	0.5
3812	4.4 (6 DU/Ac)	0.5
3813	5.7 (6 DU/Ac)	0.5
3801	19.3 (6 DU/Ac)	0.5
3816	6.4 (6 DU/Ac)	0.5
3817	5.8 (6 DU/Ac)	0.5
3818	6.8 (6 DU/Ac)	0.5
3802	12.1 (6 DU/Ac)	0.5
3803	4.1 (6 DU/Ac)	0.5
3804	7.2 (6 DU/Ac)	0.5

*From OC Hydrology Manual figure C-4: "Actual Impervious Cover for Developed Areas"

Input parameters into AES Program:
Time of Concentration: 52.3 min.
Total Area: 1138.82 Ac
Effective Area: 1138.82 Ac (assume it is the same as "Total Area")
Total Runoff: 830.3 cfs
Fp = 0.25 in/hr (From OC Hydrology Manual table C.2: "Maximum Effective Pervious Area Loss Rates")
Pervious Area Fraction Ap: 0.5

Total Off-Site Flow to 3732-3733:

Areas Contributing to Flow at Node (Per 1993 Drainage Study by Boyle Engineering):		
Node	Area (Acres)	Pervious Area Fraction*
3731	3.1 (6 DU/Ac)	0.5
3732	3.5 (6 DU/AC)	0.5
	1.4 (4 DU/Ac)	0.6

*From OC Hydrology Manual figure C-4: "Actual Impervious Cover for Developed Areas"

Input parameters into AES Program:
Time of Concentration: 21.2 min.
Total Area: 8.0 Ac
Effective Area: 8.0 Ac (assume it is the same as "Total Area")
Total Runoff: 22.0 cfs
Fp = 0.25 in/hr (From OC Hydrology Manual table C.2: "Maximum Effective Pervious Area Loss Rates")
Pervious Area Fraction Ap: 0.52

Total Off-Site Flow to 3738-3739:

Areas Contributing to Flow at Node (Per 1993 Drainage Study by Boyle Engineering):		
Node	Area (Acres)	Pervious Area Fraction*
3735	7.3 (6 DU/Ac)	0.5
3736	9.8 (6 DU/Ac)	0.5
3737	10.6 (6 DU/Ac)	0.5
3738	7.0 (6 DU/Ac)	0.5
	1.4 (4 DU/Ac)	0.6

*From OC Hydrology Manual figure C-4: "Actual Impervious Cover for Developed Areas"

Input parameters into AES Program:
Time of Concentration: 26.9 min.
Total Area: 36.1 Ac
Effective Area: 36.1 Ac (assume it is the same as "Total Area")
Total Runoff: 36.6 cfs
Fp = 0.25 in/hr (From OC Hydrology Manual table C.2: "Maximum Effective Pervious Area Loss Rates")
Pervious Area Fraction Ap: 0.5

Total Off-Site Flow to 3744-3745:

Areas Contributing to Flow at Node (Per 1993 Drainage Study by Boyle Engineering):		
Node	Area (Acres)	Pervious Area Fraction*
3741	0.1 (Commercial)	0.1
	1.9 (Apartment)	0.2
	2.1 (6 DU/Ac)	0.5
3742	1.4 (Commercial)	0.1
	1.3 (Apartment)	0.2
	2.9 (6 DU/Ac)	0.5
3743	0.7 (Commercial)	0.1
	3.7 (Apartment)	0.2
	1.6 (6 DU/Ac)	0.5
3744	9.2 (Apartment)	0.2
	0.1 (6 DU/Ac)	0.5

*From OC Hydrology Manual figure C-4: "Actual Impervious Cover for Developed Areas"

Input parameters into AES Program:
Time of Concentration: 22.0 min.
Total Area: 25.0 Ac
Effective Area: 25.0 Ac (assume it is the same as "Total Area")
Total Runoff: 30.0 fs
Fp = 0.25 in/hr (From OC Hydrology Manual table C.2: "Maximum Effective Pervious Area Loss Rates")
Pervious Area Fraction Ap: 0.27

Total Off-Site Flow to 3752-3747:

Areas Contributing to Flow at Node (Per 1993 Drainage Study by Boyle Engineering):		
Node	Area (Acres)	Pervious Area Fraction*
3748	3.7 (Commercial)	0.1
	0.4 (Apartment)	0.2
3749	5.2 (Commercial)	0.1
	0.2 (Apartment)	0.2
3750	5.3 (Commercial)	0.1
	0.2 (Apartment)	0.2
3751	8.1 (Commercial)	0.1
	0.2 (Apartment)	0.2
3752	6.7 (Commercial)	0.1
	1.3 (4DU/Ac)	0.6

*From OC Hydrology Manual figure C-4: "Actual Impervious Cover for Developed Areas"

Input parameters into AES Program:
Time of Concentration: 24.6 min.
Total Area: 31.3 Ac
Effective Area: 31.3 Ac (assume it is the same as "Total Area")
Total Runoff: 36.3 cfs
Fp = 0.25 in/hr (From OC Hydrology Manual table C.2: "Maximum Effective Pervious Area Loss Rates")
Pervious Area Fraction Ap: 0.12

Note: As two parallel storm drain lines were placed in Main Street subsequent to the Boyle study in 1993, the original sub-basin area (#3746) has been split into two separate drainage basins (shown on the Drainage Map as #3746 and #37460). It is assumed that the flow to the east of Main will reach the catch basin in the 30" line, while flow to the west of Main Street will be carried in the 1'x3' RCB.

STANDARD AVE TO GRAND AVENUE:

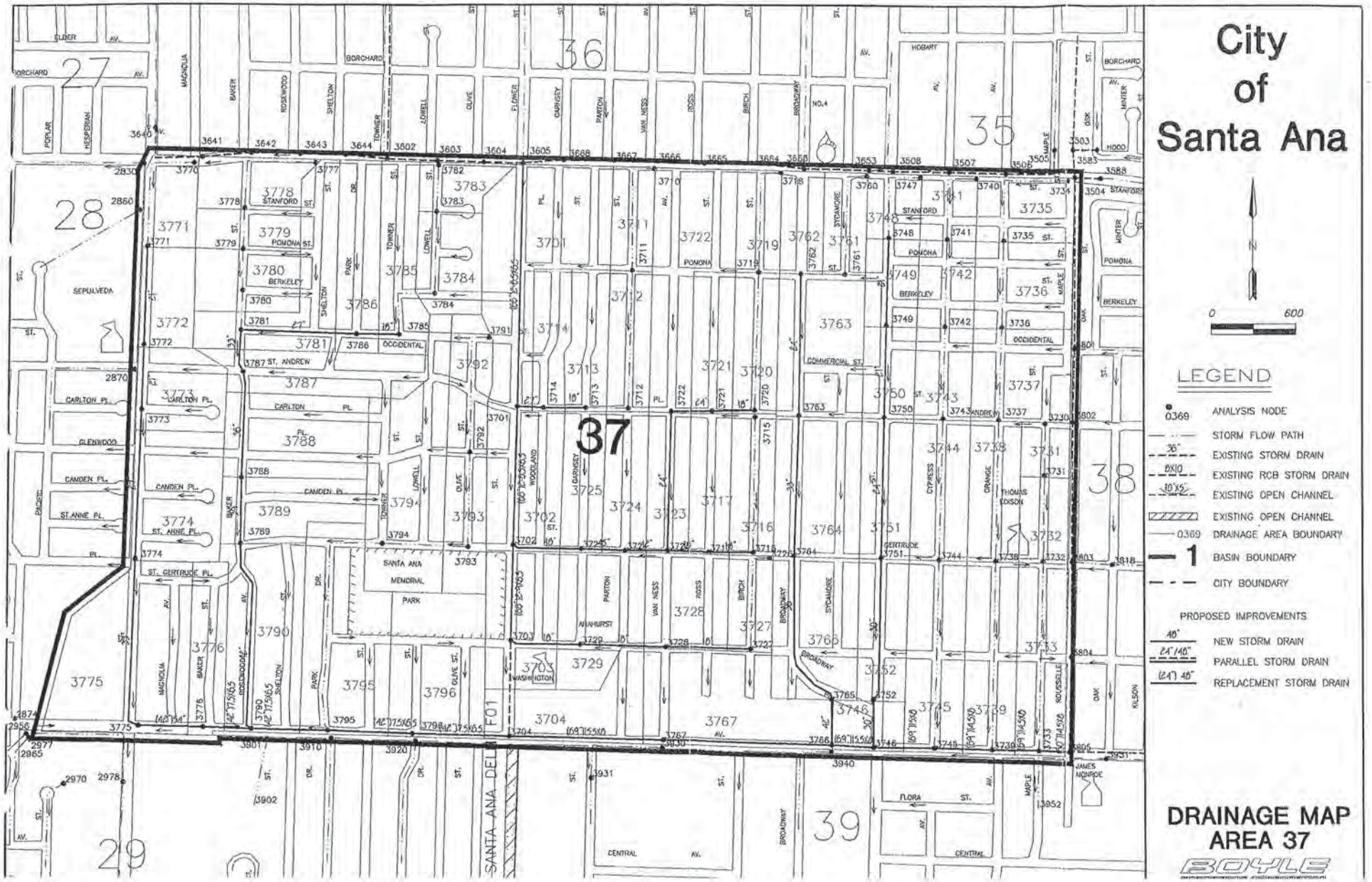
Total Off-Site Flow to 4704-4705:

Areas Contributing to Flow at Node (Per 1993 Drainage Study by Boyle Engineering):		
Node	Area (Acres)	Pervious Area Fraction*
4602 (From Memory Bank)	231.63	
4711	5.2 (Commercial)	0.1
4701	6.8 (Commercial)	0.1
4716	7.9 (Commercial)	0.1
4717	18.0 (Commercial)	0.1
4703	7.1 (Commercial)	0.1
4721	7.7 (Commercial)	0.1
4722	12.4 (Commercial)	0.1
4704	12.1 (Commercial)	0.1

*From OC Hydrology Manual figure C-4: “Actual Impervious Cover for Developed Areas”

Input parameters into AES Program:
Time of Concentration: 25.9 min.
Total Area: 277.5 Ac
Effective Area: 277.5 Ac (assume it is the same as “Total Area”)
Total Runoff: 342.1cfs
Fp = 0.25 in/hr (From OC Hydrology Manual table C.2: “Maximum Effective Pervious Area Loss Rates”)
Pervious Area Fraction Ap: 0.1

APPENDIX I: EXISTING HYDROLOGY (BOYLE ENGINEERING)


City of Santa Ana
LEGEND
0369 ANALYSIS NODE
STORM FLOW PATH
36" EXISTING STORM DRAIN
8X10 EXISTING RCB STORM DRAIN
10'X5' EXISTING OPEN CHANNEL
EXISTING OPEN CHANNEL
0369 DRAINAGE AREA BOUNDARY
1 BASIN BOUNDARY
CITY BOUNDARY
PROPOSED IMPROVEMENTS
48" NEW STORM DRAIN
24"/48" PARALLEL STORM DRAIN
(24") 48" REPLACEMENT STORM DRAIN
0
600
DRAINAGE MAP
AREA 37
BOYLE
37
36
35
38
39
28
29
27
SANTA ANA DEL
F01

ID	Roadway Name	Roadway Slope (ft/ft)	Roadway K	Existing Drain Diam/Depth (in)/ (ft)	Existing Drain Base Width (ft)	Existing Drain Side Slope	Existing Drain Slope (ft/ft)	Existing Drain K	Design Runoff (cfs)	Section Capacity Roadway (cfs)	Section Capacity Conduit (cfs)	Section Capacity Total (cfs)	Deficient Capacity (cfs)	Improvement Alternatives Replacement	Improvement Alternatives New/Parallel	Recommended Improvement
Map Area:37																
3605-3701	FLOWER	0.0050	566	66.0			0.00357	3365	1007.5	40.0	201.1	241.1	766.4	2@8.5x6.5 RCB	12.5x6.5 RCB	2@8.5x6.5 RCB
3711-3712	PARTON	0.0050	566						12.9	40.0	0.0	40.0	0.0			
3712-3713	ST. ANDREWS	0.0020	382						12.9	17.1	0.0	17.1	0.0			
3713-3714	ST. ANDREWS	0.0020	382						19.3	17.1	0.0	17.1	2.2		18" RCP	18" RCP
3714-3701	ST. ANDREWS	0.0020	283						24.5	12.7	0.0	12.7	11.9		27" RCP	27" RCP
3701-3702	FLOWER	0.0050	566	66.0			0.00357	3365	1019.2	40.0	201.1	241.1	778.1	2@8.5x6.5 RCB	12.5x6.5 RCB	2@8.5x6.5 RCB
3716-3717	ST. GERTRUDE	0.0020	283						16.6	12.7	0.0	12.7	3.9		18" RCP	18" RCP
3717-3723	ST. GERTRUDE	0.0020	283						16.6	12.7	0.0	12.7	3.9		18" RCP	18" RCP
3719-3720	BIRCH	0.0050	566						13.2	40.0	0.0	40.0	0.0			
3720-3721	ST. ANDREWS	0.0020	283						13.2	12.7	0.0	12.7	0.6		18" RCP	18" RCP
3721-3722	ST. ANDREWS	0.0020	283						20.0	12.7	0.0	12.7	7.4		24" RCP	24" RCP
3722-3723	VAN NESS	0.0050	566						36.4	40.0	0.0	40.0	0.0			24" RCP
3723-3724	ST. GERTRUDE	0.0020	283						56.8	12.7	0.0	12.7	44.2		42" RCP	42" RCP
3724-3725	ST. GERTRUDE	0.0020	283						61.6	12.7	0.0	12.7	48.9		45" RCP	45" RCP
3725-3702	ST. GERTRUDE	0.0020	283						67.8	12.7	0.0	12.7	55.1		48" RCP	48" RCP
3702-3703	FLOWER	0.0050	566	66.0			0.00357	3365	1069.1	40.0	201.1	241.1	828.0	2@9x6.5 RCB	13x6.5 RCB	2@9x6.5 RCB
3727-3728	ANAHURST	0.0020	283						16.2	12.7	0.0	12.7	3.5		18" RCP	18" RCP
3728-3729	ANAHURST	0.0020	283						16.2	12.7	0.0	12.7	3.5		18" RCP	18" RCP
3729-3703	ANAHURST	0.0020	566						28.3	25.3	0.0	25.3	3.0		18" RCP	18" RCP
3703-3704	FLOWER	0.0050	566				0.00357	27039	1085.7	40.0	1615.6	1655.6	0.0			
3805-3733	WARNER	0.0020	35	60.0			0.00200	2610	978.9	1.6	116.7	118.3	860.6	15x8 RCB	2@10x6.5 RCB	14.5x8 RCB
3731-3732	MAPLE	0.0050	566						10.9	40.0	0.0	40.0	0.0			
3732-3733	MAPLE	0.0050	566						10.9	40.0	0.0	40.0	0.0			
3733-3739	WARNER	0.0020	35	69.0			0.00200	3789	987.2	1.6	169.5	171.0	816.2	15x8 RCB	2@9.5x6.5 RCB	14.5x8 RCB
3735-3736	ORANGE	0.0050	566						19.4	40.0	0.0	40.0	0.0			
3736-3737	ORANGE	0.0050	566						19.4	40.0	0.0	40.0	0.0			
3737-3738	ORANGE	0.0050	566						30.0	40.0	0.0	40.0	0.0			
3738-3739	ORANGE	0.0050	566						36.6	40.0	0.0	40.0	0.0			
3739-3745	WARNER	0.0020	35	69.0			0.00200	3789	1018.2	1.6	169.5	171.0	847.2	2@11x6.5 RCB	2@9.5x6.5 RCB	15x8 RCB
3741-3742	CYPRESS	0.0050	566						13.7	40.0	0.0	40.0	0.0			
3742-3743	CYPRESS	0.0050	566						13.7	40.0	0.0	40.0	0.0			
3743-3744	CYPRESS	0.0050	566						20.3	40.0	0.0	40.0	0.0			
3744-3745	CYPRESS	0.0050	566						30.0	40.0	0.0	40.0	0.0			
3745-3746	WARNER	0.0050	35	69.0			0.00200	3789	1035.7	2.5	169.5	171.9	863.7	15.5x8 RCB	2@10x6.5 RCB	15x8 RCB
3748-3749	MAIN	0.0050	70						13.7	5.0	0.0	5.0	8.8		21" RCP	21" RCP
3749-3750	MAIN	0.0050	70						13.7	5.0	0.0	5.0	8.8		21" RCP	21" RCP
3750-3751	MAIN	0.0050	70						19.9	5.0	0.0	5.0	14.9		24" RCP	24" RCP
3751-3752	MAIN	0.0050	70						28.7	5.0	0.0	5.0	23.7		30" RCP	30" RCP
3752-3746	MAIN	0.0050	561						36.3	39.7	0.0	39.7	0.0			30" RCP
3746-3766	WARNER	0.0020	35	69.0			0.00200	3789	1050.6	1.6	169.5	171.0	879.6	15.5x8 RCB	2@10x6.5 RCB	15.5x8 RCB
3761-3762	POMONA	0.0020	566						15.5	25.3	0.0	25.3	0.0			
3762-3763	BROADWAY	0.0050							15.5	0.0	0.0	0.0	15.5		24" RCP	24" RCP
3763-3764	BROADWAY	0.0050							32.3	0.0	0.0	0.0	32.3		33" RCP	33" RCP
3764-3765	BROADWAY	0.0050							46.4	0.0	0.0	0.0	46.4		36" RCP	36" RCP
3765-3766	BROADWAY	0.0050							59.8	0.0	0.0	0.0	59.8		42" RCP	42" RCP
3766-3767	WARNER	0.0020	30	69.0			0.00200	3789	1077.2	1.3	169.5	170.8	906.4	2@11.5x6.5 RC	2@10.5x6.5 RC	15.5x8 RCB
3767-3704	WARNER	0.0020	30	69.0			0.00200	3789	1077.2	1.3	169.5	170.8	906.4	2@11.5x6.5 RC	2@10.5x6.5 RC	15.5x8 RCB
3771-3772	BRISTOL	0.0050	70						14.2	5.0	0.0	5.0	9.2		21" RCP	21" RCP
3772-3773	BRISTOL	0.0050	70						14.2	5.0	0.0	5.0	9.2		21" RCP	21" RCP
3773-3774	BRISTOL	0.0050	70						23.1	5.0	0.0	5.0	18.1		27" RCP	27" RCP
3774-3775	BRISTOL	0.0050	70						36.1	5.0	0.0	5.0	31.2		33" RCP	33" RCP
3775-3776	WARNER	0.0010	70	42.0			0.00100	1008	58.2	2.2	31.9	34.1	24.1	54" RCP	39" RCP	54" RCP
3776-3790	WARNER	0.0010	70	42.0			0.00100	1008	62.4	2.2	31.9	34.1	28.3	54" RCP	42" RCP	54" RCP

ID	Roadway Name	Roadway Slope (ft/ft)	Roadway K	Existing Drain Diam/Depth (in)/ (ft)	Existing Drain Base Width (ft)	Existing Drain Side Slope	Existing Drain Slope (ft/ft)	Existing Drain K	Design Runoff (cfs)	Section Capacity Roadway (cfs)	Section Capacity Conduit (cfs)	Section Capacity Total (cfs)	Deficient Capacity (cfs)	Improvement Alternatives Replacement	Improvement Alternatives New/Parallel	Recommended Improvement
3778-3779	BAKER	0.0050	566						13.4	40.0	0.0	40.0	0.0			
3779-3780	BAKER	0.0050	566						13.4	40.0	0.0	40.0	0.0			
3780-3781	BAKER	0.0050	566						21.9	40.0	0.0	40.0	0.0			
3783-3784	LOWELL	0.0050	566						17.1	40.0	0.0	40.0	0.0			
3784-3785	BERKELEY	0.0050	566						17.1	40.0	0.0	40.0	0.0			
3785-3786	OCCIDENTAL	0.0020	566						28.2	25.3	0.0	25.3	2.8		18" RCP	18" RCP
3786-3781	OCCIDENTAL	0.0020	566						38.8	25.3	0.0	25.3	13.5		27" RCP	27" RCP
3781-3787	BAKER	0.0050	566						74.3	40.0	0.0	40.0	34.3		33" RCP	33" RCP
3787-3788	BAKER	0.0050	566						81.3	40.0	0.0	40.0	41.3		36" RCP	36" RCP
3788-3789	BAKER	0.0050	566						93.7	40.0	0.0	40.0	53.7		39" RCP	39" RCP
3789-3790	ROSEWOOD	0.0050	566						102.0	40.0	0.0	40.0	62.0		42" RCP	42" RCP
3790-3795	WARNER (ADV)	0.0010		42.0			0.00100	1008	175.8	0.0	31.9	31.9	143.9	81" RCP	75" RCP	81" RCP
3792-3793	OLIVE	0.0050	566						14.7	40.0	0.0	40.0	0.0			
3793-3794	ST. GERTRUDE	0.0020	566						14.7	25.3	0.0	25.3	0.0			
3794-3795	PARK	0.0050	566						34.6	40.0	0.0	40.0	0.0			
3795-3796	WARNER (ADV)	0.0010		42.0			0.00100	1008	215.3	0.0	31.9	31.9	183.4	7.5x6.5 RCB	81" RCP	7.5x6.5 RCB
3796-3704	WARNER (ADV)	0.0010		42.0			0.00100	1008	216.4	0.0	31.9	31.9	184.5	7.5x6.5 RCB	84" RCP	7.5x6.5 RCB

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 37

[ORANGE COUNTY]

FILE NAME:SA37.DAT — CALCULATED BY:
TIME/DATE OF STUDY: 10:46 2/23/1994 — CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) — PAGE NUMBER 1 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
3605.00	MEMORY BANK # 1 DEFINED AS FOLLOWS:													
	Q(cfs) 1007.45	Tc(min) 42.49	Fm(in/hr) .102	Ybar .43	AREA(acres) 1264.00									
3605.00	MEMORY BANK # 1 COPIED ONTO MAIN-STREAM													
	Q(cfs) 1007.45	Tc(min) 42.49	Fm(in/hr) .102	Ybar .43	AREA(acres) 1264.00									
											1716	.0036	14.4	Qpipe=1007.4cfs
														n=.0130 D= 7.9
3701.00					2.0									126.0"-PIPE
3701.00	22.2	1286.3	C	6D/AC	44.5	.93	.13	.103	1007.4					ADD SUBAREA

UNIT HYDROGRAPH INFORMATION

Tc(MIN.) = 44.48 LAG TIME(HR) = .59 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .103; Ybar = .426
TOTAL AREA(ACRES)= 1286.3 UPSTREAM NODE OF LONGEST WATERCOURSE = 3280.0 WITH LENGTH = 18240.3 FEET
RAINFALL(INCH): 5M = .26; 30M = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03
DEPTH-AREA FACTORS: 5M = .94; 30M = .94; 1HR = .94; 3HR = .99; 6HR = 1.00; 24HR= 1.00
S-GRAPH : VALLEY = 100.0%; FOOTHILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = .0%
PEAK FLOW RATE(CFS)= 1007.45 TIME OF PEAK(HR) = 16.7 VOLUME(AF)= 212.27

3701.00		1286.3				44.5	.93			1007.4				FOR CONFLUENCE
					..						863	.0050	..	INITIAL SUBAREA
3711.00	5.0	5.0	C	6D/AC	16.8	1.69	.13	.125	7.1					
											973	.0050	2.2	Qest.= 10.8cfs
48.ft-STREET														D= .4 ,D*V= 1.0
FLOW TO PT.#					7.9									FLOODWIDTH=15.8
3712.00	6.9	11.9	C	6D/AC	24.6	1.32	.13	.125	12.8					
											303	.0020	3.9	Qpipe= 12.8cfs
														n=.0130 D= 1.8
3713.00					1.3									27.0"-PIPE
3713.00	6.6	18.5	C	6D/AC	25.9	1.28	.13	.125	19.3					ADD SUBAREA

1-1-38

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 37

[ORANGE COUNTY]

FILE NAME:SA37.DAT — CALCULATED BY:
TIME/DATE OF STUDY: 10:46 2/23/1994 — CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) — PAGE NUMBER 2 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
											301	.0020	4.3	Qpipe= 19.3cfs n=.0130 D= 1.9
3714.00					1.2									33.0"-PIPE
3714.00	5.7	24.3	C	6D/AC		27.1	1.25	.13	.125	24.5				ADD SUBAREA
											186	.0020	4.6	Qpipe= 24.5cfs n=.0130 D= 2.1
3701.00					.7									36.0"-PIPE
CONFLUENCE ANALYSIS FOR POINT# 3701.00	PEAK FLOW RATE(CFS) = 1019.2 TIME OF CONCENTRATION(MIN.) = 44.5 LAG TIME(HR) = .59 MEAN VALUES: Fm(IN/HR) = .103; Ybar = .430 TOTAL AREA(ACRES) = 1310.52													

UNIT HYDROGRAPH INFORMATION

Tc(MIN.) = 44.48 LAG TIME(HR) = .59 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .103; Ybar = .430
TOTAL AREA(ACRES)= 1310.5 UPSTREAM NODE OF LONGEST WATERCOURSE = 3280.0 WITH LENGTH = 18240.3 FEET
RAINFALL(INCH): 5M = .26; 30M = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03
DEPTH-AREA FACTORS: 5M = .94; 30M = .94; 1HR = .94; 3HR = .99; 6HR = 1.00; 24HR= 1.00
S-GRAPH : VALLEY = 100.0%; FOOTHILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = .0%
PEAK FLOW RATE(CFS)= 1019.19 TIME OF PEAK(HR) = 16.7 VOLUME(AF)= 215.45

											977	.0036	14.4	Qpipe=1019.2cfs n=.0130 D= 8.0
3702.00					1.1									126.0"-PIPE
3702.00	12.4	1322.9	C	6D/AC		45.6	.92	.13	.103	1020.0				ADD SUBAREA

UNIT HYDROGRAPH INFORMATION

Tc(MIN.) = 45.61 LAG TIME(HR) = .61 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .103; Ybar = .430
TOTAL AREA(ACRES)= 1322.9 UPSTREAM NODE OF LONGEST WATERCOURSE = 3280.0 WITH LENGTH = 19217.7 FEET
RAINFALL(INCH): 5M = .26; 30M = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03
DEPTH-AREA FACTORS: 5M = .94; 30M = .94; 1HR = .94; 3HR = .99; 6HR = 1.00; 24HR= 1.00
S-GRAPH : VALLEY = 100.0%; FOOTHILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = .0%
PEAK FLOW RATE(CFS)= 1020.02 TIME OF PEAK(HR) = 16.7 VOLUME(AF)= 217.41

3702.00	MAIN-STREAM COPIED ONTO MEMORY BANK # 2

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 37

[ORANGE COUNTY]

FILE NAME:SA37.DAT | CALCULATED BY:
TIME/DATE OF STUDY: 10:46 2/23/1994 | CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) | PAGE NUMBER 3 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
					..						955	.0050	..	INITIAL SUBAREA
3716.00	7.1	7.1	C	6D/AC	----	17.5	1.64	.13	.125	9.7	----	-----	----	----------
											314	.0020	1.7	Qest.= 13.8cfs
48.ft-STREET														D= .6 ,D*V= 1.0
FLOW TO PT.#					3.2									FLOODWIDTH=29.3
3717.00	6.9	14.0	C	6D/AC	----	20.6	1.44	.13	.125	16.6	----	-----	----	----------
											298	.0020	4.1	Qpipe= 16.6cfs
														n=.0130 D= 1.9
3723.00					1.2									30.0"-PIPE
3723.00	6.8	20.8	C	6D/AC	----	21.8	1.40	.13	.125	23.9	----	-----	----	ADD SUBAREA
3723.00		20.8			----	21.8	1.40			23.9	----	-----	----	FOR CONFLUENCE
					..						836	.0050	..	INITIAL SUBAREA
3719.00	5.1	5.1	C	6D/AC	----	16.6	1.70	.13	.125	7.3	----	-----	----	----------
											973	.0050	2.2	Qest.= 11.1cfs
48.ft-STREET														D= .4 ,D*V= 1.0
FLOW TO PT.#	5.6		C	6D/AC	7.8			.13						FLOODWIDTH=16.0
3720.00	1.4	12.2	C	4D/AC	----	24.4	1.33	.15	.128	13.2	----	-----	----	----------
											303	.0020	3.9	Qpipe= 13.2cfs
														n=.0130 D= 1.8
3721.00					1.3									27.0"-PIPE
3721.00	6.9	19.1	C	6D/AC	----	25.7	1.29	.13	.127	20.0	----	-----	----	ADD SUBAREA
											293	.0020	4.4	Qpipe= 20.0cfs
														n=.0130 D= 2.0
3722.00					1.1									33.0"-PIPE
3722.00	16.6	35.7	C	6D/AC	----	26.8	1.26	.13	.126	36.4	----	-----	----	ADD SUBAREA
											982	.0050	7.0	Qpipe= 36.4cfs
														n=.0130 D= 2.2
3723.00					2.3									33.0"-PIPE

1-1-40

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 37

[ORANGE COUNTY]

FILE NAME:SA37.DAT — CALCULATED BY:
TIME/DATE OF STUDY: 10:46 2/23/1994 — CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) — PAGE NUMBER 4 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
CONFLUENCE ANALYSIS FOR POINT# 3723.00	PEAK FLOW RATE(CFS) = 56.8													
	TIME OF CONCENTRATION(MIN.) = 21.8													LARGEST CONFLUENCE Q= 56.8
	MEAN VALUES: Fp(IN/HR) = .250; Ap = .502; Fm(IN/HR) = .126													
	EFFECTIVE AREA(ACRES) = 47.58 TOTAL AREA(ACRES) = 56.50													
	Q(cfs) 56.81					Tc(min) 21.85		Fp(avg) .250		Ap(avg) .50		Fm(avg) .126		I(in/hr) 1.40	Ae(acres) 47.58	NODE 3715.0
	Q(cfs) 56.20					Tc(min) 29.12		Fp(avg) .250		Ap(avg) .50		Fm(avg) .126		I(in/hr) 1.19	Ae(acres) 56.50	NODE 3718.0
													298	.0020	5.6	Qpipe= 56.8cfs
																n=.0130 D= 3.0
3724.00					.9											48.0"-PIPE
3724.00	7.0	54.6	C	6D/AC		22.7	1.38	.13	.125	61.6						ADD SUBAREA
													314	.0020	5.7	Qpipe= 61.6cfs
																n=.0130 D= 3.2
3725.00					.9											48.0"-PIPE
3725.00	6.8	61.4	C	6D/AC		23.7	1.35	.13	.125	67.7						ADD SUBAREA
													490	.0020	5.9	Qpipe= 67.7cfs
																n=.0130 D= 3.2
3702.00					1.4											51.0"-PIPE
3702.00	MEMORY BANK # 2 CONFLUENCED WITH MAIN-STREAM															

UNIT HYDROGRAPH INFORMATION

Tc(MIN.) = 45.61 LAG TIME(HR) = .61 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .104; Ybar = .435
TOTAL AREA(ACRES)= 1393.3 UPSTREAM NODE OF LONGEST WATERCOURSE = 3280.0 WITH LENGTH = 19217.7 FEET
RAINFALL(INCH): 5M = .26; 30M = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03
DEPTH-AREA FACTORS: 5M = .94; 30M = .94; 1HR = .94; 3HR = .99; 6HR = 1.00; 24HR= 1.00
S-GRAPH : VALLEY = 100.0%; FOOTHILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = .0%
PEAK FLOW RATE(CFS)= 1069.06 TIME OF PEAK(HR) = 16.7 VOLUME(AF)= 227.37

													675	.0036	14.4	Qpipe=1069.1cfs
																n=.0130 D= 8.4
3703.00					.8											126.0"-PIPE

1-1-41

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 37

[ORANGE COUNTY]

FILE NAME:SA37.DAT — CALCULATED BY:
TIME/DATE OF STUDY: 10:46 2/23/1994 — CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) — PAGE NUMBER 5 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
	6.8		C	6D/AC				.13						
	1.9		C	4D/AC				.15						
3703.00	2.7	1404.7	C	Park	----	46.4	.91	.21	.105	1069.1	----	-----	----	ADD SUBAREA

UNIT HYDROGRAPH INFORMATION

Tc(MIN.) = 46.39 LAG TIME(HR) = .62 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .105; Ybar = .436
TOTAL AREA(ACRES)= 1404.7 UPSTREAM NODE OF LONGEST WATERCOURSE = 3280.0 WITH LENGTH = 19892.7 FEET
RAINFALL(INCH): 5M = .26; 30M = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03
DEPTH-AREA FACTORS: 5M = .94; 30M = .94; 1HR = .94; 3HR = .99; 6HR = 1.00; 24HR= 1.00
S-GRAPH : VALLEY = 100.0%; FOOTHILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = .0%
PEAK FLOW RATE(CFS)= 1069.06 TIME OF PEAK(HR) = 16.7 VOLUME(AF)= 229.00

3703.00		72.9			----	46.4	.91			1069.1	----	-----	----	FOR CONFLUENCE
					..						755	.0050	..	INITIAL SUBAREA
3727.00	4.8	4.8	C	6D/AC	----	15.9	1.75	.13	.125	7.0	----	-----	----	----------
48.ft-STREET											606	.0020	1.7	Qest.= 12.3cfs
FLOW TO PT.#					6.1									D= .6 ,D*V= 1.0
3728.00	9.3	14.1	C	6D/AC	----	22.0	1.40	.13	.125	16.2	----	-----	----	FLOODWIDTH=29.3
											606	.0020	4.1	Qpipe= 16.2cfs
														n=.0130 D= 1.9
3729.00					2.5									30.0"-PIPE
	10.1		C	6D/AC				.13						
3729.00	2.0	26.2	C	4D/AC	----	24.5	1.33	.15	.127	28.3	----	-----	----	ADD SUBAREA
											501	.0020	4.7	Qpipe= 28.3cfs
														n=.0130 D= 2.4
3703.00					1.8									36.0"-PIPE

1-1-42

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 37

[ORANGE COUNTY]

FILE NAME:SA37.DAT | CALCULATED BY:
TIME/DATE OF STUDY: 10:46 2/23/1994 | CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) | PAGE NUMBER 6 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
CONFLUENCE ANALYSIS FOR POINT# 3703.00	PEAK FLOW RATE(CFS) = 1085.7 TIME OF CONCENTRATION(MIN.) = 46.4 LAG TIME(HR) = .62 MEAN VALUES: Fm(IN/HR) = .105; Ybar = .438 TOTAL AREA(ACRES) = 1430.91													
UNIT HYDROGRAPH INFORMATION														
Tc(MIN.) = 46.39 LAG TIME(HR) = .62 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .105; Ybar = .438														
TOTAL AREA(ACRES)= 1430.9 UPSTREAM NODE OF LONGEST WATERCOURSE = 3280.0 WITH LENGTH = 19892.7 FEET														
RAINFALL(INCH): 5M = .26; 30M = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03														
DEPTH-AREA FACTORS: 5M = .94; 30M = .94; 1HR = .94; 3HR = .99; 6HR = 1.00; 24HR= 1.00														
S-GRAPH : VALLEY = 100.0%; FOOTHILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = .0%														
PEAK FLOW RATE(CFS)= 1085.67 TIME OF PEAK(HR) = 16.7 VOLUME(AF)= 232.55														
										673	.0036	14.4	Qpipe=1085.7cfs	
													n=.0130 D= 8.5	
3704.00					.8								126.0"-PIPE	
	6.5		C	6D/AC				.13						
	4.3		C	4D/AC				.15						
3704.00	.1	1441.9	D	6D/AC	47.2	.90	.10	.105	1085.7				ADD SUBAREA	
UNIT HYDROGRAPH INFORMATION														
Tc(MIN.) = 47.17 LAG TIME(HR) = .63 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .105; Ybar = .438														
TOTAL AREA(ACRES)= 1441.9 UPSTREAM NODE OF LONGEST WATERCOURSE = 3280.0 WITH LENGTH = 20566.4 FEET														
RAINFALL(INCH): 5M = .26; 30M = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03														
DEPTH-AREA FACTORS: 5M = .94; 30M = .94; 1HR = .94; 3HR = .99; 6HR = 1.00; 24HR= 1.00														
S-GRAPH : VALLEY = 100.0%; FOOTHILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = .0%														
PEAK FLOW RATE(CFS)= 1085.67 TIME OF PEAK(HR) = 16.7 VOLUME(AF)= 234.22														
3704.00	MEMORY BANK # 2 CLEARED													
3704.00	MAIN-STREAM COPIED ONTO MEMORY BANK # 3													

1-1-43

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 37

[ORANGE COUNTY]

FILE NAME:SA37.DAT
TIME/DATE OF STUDY: 10:46 2/23/1994
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES)

CALCULATED BY:
CHECKED BY:
PAGE NUMBER 7 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
3805.00	MEMORY BANK # 1 CLEARED													
3805.00	MEMORY BANK # 1 DEFINED AS FOLLOWS:													
	Q(cfs)	Tc(min)	Fm(in/hr)	Ybar	AREA(acres)									
	978.92	52.99	.094	.39	1365.15									
3805.00	MEMORY BANK # 1 COPIED ONTO MAIN-STREAM													
	Q(cfs)	Tc(min)	Fm(in/hr)	Ybar	AREA(acres)									
	978.92	52.99	.094	.39	1365.15									
											224	.0020	11.4	Qpipe= 978.9cfs
														n=.0130 D= 8.8
3733.00				.3										138.0"-PIPE
3733.00		1365.1			53.3	.90			978.9					FOR CONFLUENCE
				..							366	.0050	..	INITIAL SUBAREA
3731.00	3.1	3.1	C	6D/AC	11.9	2.03	.13	.125	5.3					
											606	.0050	2.1	Qest.= 8.6cfs
48.ft-STREET														D= .4 ,D*V= .9
FLOW TO PT.#	3.5		C	6D/AC	5.2			.13						FLOODWIDTH=14.4
3732.00	1.4	7.9	C	4D/AC		17.1	1.66	.15	.129	10.9				
											1332	.0050	5.4	Qpipe= 10.9cfs
														n=.0130 D= 1.2
3733.00					4.1									24.0"-PIPE
	10.8		C	6D/AC				.13						
3733.00	.1	18.8	C	4D/AC		21.2	1.42	.15	.127	22.0				ADD SUBAREA

1-1-44

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 37

[ORANGE COUNTY]

FILE NAME:SA37.DAT | CALCULATED BY:
TIME/DATE OF STUDY: 10:46 2/23/1994 | CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) | PAGE NUMBER 8 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
CONFLUENCE ANALYSIS FOR POINT# 3733.00	PEAK FLOW RATE(CFS) = 987.2 TIME OF CONCENTRATION(MIN.) = 53.3 LAG TIME(HR) = .71 MEAN VALUES: Fm(IN/HR) = .095; Ybar = .393 TOTAL AREA(ACRES) = 1384.00													
UNIT HYDROGRAPH INFORMATION														
Tc(MIN.) = 53.31 LAG TIME(HR) = .71 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .095; Ybar = .393														
TOTAL AREA(ACRES)= 1384.0 UPSTREAM NODE OF LONGEST WATERCOURSE = 3180.0 WITH LENGTH = 20203.7 FEET														
RAINFALL(INCH): 5M = .26; 30M = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03														
DEPTH-AREA FACTORS: 5M = .94; 30M = .94; 1HR = .94; 3HR = .99; 6HR = 1.00; 24HR= 1.00														
S-GRAPH : VALLEY = 100.0%; FOOTHILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = .0%														
PEAK FLOW RATE(CFS)= 987.20 TIME OF PEAK(HR) = 16.8 VOLUME(AF)= 237.47														
											326	.0020	11.5	Qpipe= 987.2cfs
3739.00					.5									n=.0130 D= 8.9 138.0"-PIPE
	11.2		C	6D/AC				.13						
3739.00	.1	1395.3	C	4D/AC		53.8	.84	.15	.095	988.3				ADD SUBAREA
UNIT HYDROGRAPH INFORMATION														
Tc(MIN.) = 53.79 LAG TIME(HR) = .72 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .095; Ybar = .394														
TOTAL AREA(ACRES)= 1395.3 UPSTREAM NODE OF LONGEST WATERCOURSE = 3180.0 WITH LENGTH = 20530.0 FEET														
RAINFALL(INCH): 5M = .26; 30M = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03														
DEPTH-AREA FACTORS: 5M = .94; 30M = .94; 1HR = .94; 3HR = .99; 6HR = 1.00; 24HR= 1.00														
S-GRAPH : VALLEY = 100.0%; FOOTHILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = .0%														
PEAK FLOW RATE(CFS)= 988.31 TIME OF PEAK(HR) = 16.8 VOLUME(AF)= 239.27														
3739.00		30.2				53.8	.84			988.3				FOR CONFLUENCE
					..						880	.0035	..	INITIAL SUBAREA
3735.00	7.3	7.3	C	6D/AC		18.2	1.59	.13	.125	9.6				
											612	.0050	2.4	Qest.= 15.2cfs
48.ft-STREET FLOW TO PT.# 3736.00	9.8	17.2	C	6D/AC	4.5	22.7	1.38	.13	.125	19.4				D= .5 ,D*V= 1.2 FLOODWIDTH=18.0

1-1-45

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 37

[ORANGE COUNTY]

FILE NAME:SA37.DAT — CALCULATED BY:
TIME/DATE OF STUDY: 10:46 2/23/1994 — CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) — PAGE NUMBER 9 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
											654	.0050	6.1	Qpipe= 19.4cfs
														n=.0130 D= 1.7
3737.00					1.8									27.0"-PIPE
3737.00	10.6	27.8	C	60/AC	----	24.5	1.33	.13	.125	30.0	----	-----	----	ADD SUBAREA
											999	.0050	6.9	Qpipe= 30.0cfs
														n=.0130 D= 1.9
3738.00					2.4									33.0"-PIPE
	7.0		C	60/AC				.13						
3738.00	1.4	36.1	C	40/AC	----	26.9	1.25	.15	.126	36.6	----	-----	----	ADD SUBAREA
											1326	.0050	7.2	Qpipe= 36.6cfs
														n=.0130 D= 2.0
3739.00					3.1									36.0"-PIPE
	11.2		C	60/AC				.13						
3739.00	.1	47.4	C	40/AC	----	30.0	1.16	.15	.126	44.2	----	-----	----	ADD SUBAREA

CONFLUENCE ANALYSIS FOR POINT# 3739.00

PEAK FLOW RATE(CFS) = 1018.2
TIME OF CONCENTRATION(MIN.) = 53.8 LAG TIME(HR) = .72
MEAN VALUES: Fm(IN/HR) = .096; Ybar = .399
TOTAL AREA(ACRES) = 1442.74

UNIT HYDROGRAPH INFORMATION

Tc(MIN.) = 53.79 LAG TIME(HR) = .72 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .096; Ybar = .399
TOTAL AREA(ACRES)= 1442.7 UPSTREAM NODE OF LONGEST WATERCOURSE = 3180.0 WITH LENGTH = 20530.0 FEET
RAINFALL(INCH): 5M = .26; 30M = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03
DEPTH-AREA FACTORS: 5M = .94; 30M = .94; 1HR = .94; 3HR = .99; 6HR = 1.00; 24HR= 1.00
S-GRAPH : VALLEY = 100.0%; FOOTHILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = .0%
PEAK FLOW RATE(CFS)= 1018.20 TIME OF PEAK(HR) = 16.8 VOLUME(AF)= 245.92

											403	.0020	11.5	Qpipe=1018.2cfs
														n=.0130 D= 9.2
3745.00					.6									138.0"-PIPE

1-1-46

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 37

[ORANGE COUNTY]

FILE NAME:SA37.DAT | CALCULATED BY:
TIME/DATE OF STUDY: 10:46 2/23/1994 | CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) | PAGE NUMBER 10 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
	.1		C	Com				.03						
	12.4		C	Apt				.05						
	.2		C	6D/AC				.13						
3745.00	.0	1455.5	C	4D/AC	----	54.4	.84	.15	.096	1018.6	----	-----	----	ADD SUBAREA

UNIT HYDROGRAPH INFORMATION

Tc(MIN.) = 54.37 LAG TIME(HR) = .72 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .096; Ybar = .397
TOTAL AREA(ACRES)= 1455.5 UPSTREAM NODE OF LONGEST WATERCOURSE = 3180.0 WITH LENGTH = 20933.9 FEET
RAINFALL(INCH): 5M = .26; 30M = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03
DEPTH-AREA FACTORS: 5M = .94; 30M = .94; 1HR = .94; 3HR = .99; 6HR = 1.00; 24HR= 1.00
S-GRAPH : VALLEY = 100.0%; FOOTHILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = .0%
PEAK FLOW RATE(CFS)= 1018.64 TIME OF PEAK(HR) = 16.8 VOLUME(AF)= 248.55

3745.00		60.2			----	54.4	.84			1018.6	----	-----	----	FOR CONFLUENCE
					..						626	.0035	..	INITIAL SUBAREA
	.1		C	Com	----			.03			----	-----	----	
	1.9		C	Apt	----			.05			----	-----	----	
3741.00	2.1	4.2	C	6D/AC	----	12.4	1.99	.13	.088	7.1	----	-----	----	
48.ft-STREET	1.4		C	Com				.03			616	.0050	2.2	Qest.= 11.1cfs
FLOW TO PT.#	1.3		C	Apt	5.0			.05						D= .4 ,D*V= 1.0
3742.00	2.9	9.8	C	6D/AC	----	17.3	1.65	.13	.085	13.7	----	-----	----	FLOODWIDTH=16.0
											651	.0050	5.6	Qpipe= 13.7cfs
														n=.0130 D= 1.5
3743.00					1.9									24.0"-PIPE
	.7		C	Com				.03						
	3.7		C	Apt				.05						
3743.00	1.6	15.8	C	6D/AC	----	19.3	1.51	.13	.078	20.3	----	-----	----	ADD SUBAREA
											997	.0050	6.1	Qpipe= 20.3cfs
														n=.0130 D= 1.8
3744.00					2.7									27.0"-PIPE
	9.2		C	Apt				.05						
3744.00	.1	25.0	C	6D/AC	----	22.0	1.40	.13	.068	30.0	----	-----	----	ADD SUBAREA

1-1-47

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 37

[ORANGE COUNTY]

FILE NAME:SA37.DAT — CALCULATED BY:
TIME/DATE OF STUDY: 10:46 2/23/1994 — CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) — PAGE NUMBER 11 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
											1326	.0050	6.9	Qpipe= 30.0cfs
														n=.0130 D= 1.9
3745.00					3.2									33.0"-PIPE

CONFLUENCE ANALYSIS FOR POINT# 3745.00
PEAK FLOW RATE(CFS) = 1035.7
TIME OF CONCENTRATION(MIN.) = 54.4 LAG TIME(HR) = .72
MEAN VALUES: Fm(IN/HR) = .095; Ybar = .396
TOTAL AREA(ACRES) = 1480.53

UNIT HYDROGRAPH INFORMATION

Tc(MIN.) = 54.37 LAG TIME(HR) = .72 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .095; Ybar = .396
TOTAL AREA(ACRES)= 1480.5 UPSTREAM NODE OF LONGEST WATERCOURSE = 3180.0 WITH LENGTH = 20933.9 FEET
RAINFALL(INCH): 5M = .26; 30M = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03
DEPTH-AREA FACTORS: 5M = .93; 30M = .93; 1HR = .93; 3HR = .99; 6HR = 1.00; 24HR= 1.00
S-GRAPH : VALLEY = 100.0%; FOOTHILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = .0%
PEAK FLOW RATE(CFS)= 1035.65 TIME OF PEAK(HR) = 16.8 VOLUME(AF)= 253.17

											433	.0020	11.5	Qpipe=1035.7cfs
														n=.0130 D= 9.3
3746.00					.6									138.0"-PIPE
3746.00	4.1	1484.6	C	Com		55.0	.83	.03	.095	1035.7				ADD SUBAREA

UNIT HYDROGRAPH INFORMATION

Tc(MIN.) = 55.00 LAG TIME(HR) = .73 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .095; Ybar = .396
TOTAL AREA(ACRES)= 1484.6 UPSTREAM NODE OF LONGEST WATERCOURSE = 3180.0 WITH LENGTH = 21367.3 FEET
RAINFALL(INCH): 5M = .26; 30M = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03
DEPTH-AREA FACTORS: 5M = .93; 30M = .93; 1HR = .93; 3HR = .99; 6HR = 1.00; 24HR= 1.00
S-GRAPH : VALLEY = 100.0%; FOOTHILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = .0%
PEAK FLOW RATE(CFS)= 1035.65 TIME OF PEAK(HR) = 16.8 VOLUME(AF)= 254.07

3746.00		29.1				55.0	.83			1035.7				FOR CONFLUENCE
					..						651	.0035	..	INITIAL SUBAREA
	3.7		C	Com				.03						
3748.00	.4	4.1	C	Apt		12.6	1.98	.05	.027	7.2				

1-1-48

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 37

[ORANGE COUNTY]

FILE NAME:SA37.DAT — CALCULATED BY:
TIME/DATE OF STUDY: 10:46 2/23/1994 — CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) — PAGE NUMBER 12 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
											616	.0050	2.2	Qest.= 11.1cfs
64.ft-STREET														D= .5 ,D*V= 1.0
FLOW TO PT.#	5.2		C	Com	4.9			.03						FLOODWIDTH=15.7
3749.00	.2	9.5	C	Apt	----	17.5	1.64	.05	.026	13.7	----	-----	----	
											651	.0050	5.6	Qpipe= 13.7cfs
														n=.0130 D= 1.5
3750.00					1.9									24.0"-PIPE
	5.3		C	Com				.03						
3750.00	.2	15.0	C	Apt	----	19.4	1.50	.05	.026	19.9	----	-----	----	ADD SUBAREA
											994	.0050	6.1	Qpipe= 19.9cfs
														n=.0130 D= 1.7
3751.00					2.7									27.0"-PIPE
	8.1		C	Com				.03						
3751.00	.2	23.3	C	Apt	----	22.2	1.40	.05	.026	28.7	----	-----	----	ADD SUBAREA
											1010	.0050	6.8	Qpipe= 28.7cfs
														n=.0130 D= 1.8
3752.00					2.5									33.0"-PIPE
	6.7		C	Com				.03						
	.0		C	Apt				.05						
3752.00	1.3	31.3	C	4D/AC	----	24.6	1.32	.15	.031	36.3	----	-----	----	ADD SUBAREA
											336	.0050	7.0	Qpipe= 36.3cfs
														n=.0130 D= 2.2
3746.00					.8									33.0"-PIPE

1-1-49

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 37

[ORANGE COUNTY]

FILE NAME:SA37.DAT | CALCULATED BY:
TIME/DATE OF STUDY: 10:46 2/23/1994 | CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) | PAGE NUMBER 13 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
CONFLUENCE ANALYSIS FOR POINT# 3746.00	PEAK FLOW RATE(CFS) = 1050.6													
	TIME OF CONCENTRATION(MIN.) = 55.0 LAG TIME(HR) = .73													
	MEAN VALUES: Fm(IN/HR) = .094; Ybar = .391													
	TOTAL AREA(ACRES) = 1515.89													
UNIT HYDROGRAPH INFORMATION														
Tc(MIN.) = 55.00 LAG TIME(HR) = .73 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .094; Ybar = .391														
TOTAL AREA(ACRES)= 1515.9 UPSTREAM NODE OF LONGEST WATERCOURSE = 3180.0 WITH LENGTH = 21367.3 FEET														
RAINFALL(INCH): 5M = .26; 30M = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03														
DEPTH-AREA FACTORS: 5M = .93; 30M = .93; 1HR = .93; 3HR = .99; 6HR = .99; 24HR= 1.00														
S-GRAPH : VALLEY = 100.0%; FOOTHILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = .0%														
PEAK FLOW RATE(CFS)= 1050.61 TIME OF PEAK(HR) = 16.8 VOLUME(AF)= 260.81														
										297	.0020	11.7	Qpipe=1050.6cfs n=.0130 D= 8.9
3766.00					.4								144.0"-PIPE
3766.00		31.3				55.4	1.30			1050.6			FOR CONFLUENCE
					..					823	.0050	..	INITIAL SUBAREA
	5.0		C	Com				.03					
3761.00	.0	5.1	C	6D/AC		12.9	1.96	.13	.026	8.8			
										314	.0020	1.7	Qest.= 12.7cfs D= .6 ,D*V= 1.0
48.ft-STREET FLOW TO PT.# 3762.00	2.6		C	Com	3.2			.03					FLOODWIDTH=29.3
	2.5	10.2	C	6D/AC		16.0	1.74	.13	.050	15.5			
										998	.0050	5.7	Qpipe= 15.5cfs n=.0130 D= 1.6
3763.00					2.9								24.0"-PIPE
	7.3		C	Com				.03					
	6.1		C	6D/AC				.13					
3763.00	.8	24.4	C	4D/AC		19.0	1.53	.15	.065	32.3			ADD SUBAREA
										990	.0050	6.9	Qpipe= 32.3cfs n=.0130 D= 2.0
3764.00					2.4								33.0"-PIPE

1-1-50

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 37

[ORANGE COUNTY]

FILE NAME:SA37.DAT | CALCULATED BY:
TIME/DATE OF STUDY: 10:46 2/23/1994 | CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) | PAGE NUMBER 14 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
	3.4		C	Com				.03						
3764.00	10.6	38.5	C	6D/AC		21.4	1.42	.13	.078	46.4				ADD SUBAREA
											1137	.0050	7.6	Qpipe= 46.4cfs
														n=.0130 D= 2.2
3765.00					2.5									39.0"-PIPE
	5.2		C	Com				.03						
3765.00	9.0	52.6	C	6D/AC		23.8	1.34	.13	.081	59.8				ADD SUBAREA
											320	.0050	8.1	Qpipe= 59.8cfs
														n=.0130 D= 2.5
3766.00					.7									42.0"-PIPE

CONFLUENCE ANALYSIS FOR POINT# 3766.00
PEAK FLOW RATE(CFS) = 1077.2
TIME OF CONCENTRATION(MIN.) = 55.4 LAG TIME(HR) = .74
MEAN VALUES: Fm(IN/HR) = .093; Ybar = .390
TOTAL AREA(ACRES) = 1568.48

UNIT HYDROGRAPH INFORMATION

Tc(MIN.) = 55.42 LAG TIME(HR) = .74 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .093; Ybar = .390
TOTAL AREA(ACRES)= 1568.5 UPSTREAM NODE OF LONGEST WATERCOURSE = 3180.0 WITH LENGTH = 21664.4 FEET
RAINFALL(INCH): 5M = .26; 30M = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03
DEPTH-AREA FACTORS: 5M = .93; 30M = .93; 1HR = .93; 3HR = .99; 6HR = .99; 24HR= 1.00
S-GRAPH : VALLEY = 100.0%; FOOTHILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = .0%
PEAK FLOW RATE(CFS)= 1077.17 TIME OF PEAK(HR) = 16.8 VOLUME(AF)= 270.15

											1203	.0020	11.8	Qpipe=1077.2cfs
														n=.0130 D= 9.1
3767.00					1.7									144.0"-PIPE

1-1-51

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 37

[ORANGE COUNTY]

FILE NAME:SA37.DAT — CALCULATED BY:
TIME/DATE OF STUDY: 10:46 2/23/1994 — CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) — PAGE NUMBER 15 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
	7.9		C	Com				.03						
	9.4		C	6D/AC				.13						
3767.00	.1	1585.9	D	6D/AC	----	57.1	.81	.10	.093	1077.2	----	-----	----	ADD SUBAREA

UNIT HYDROGRAPH INFORMATION

Tc(MIN.) = 57.13 LAG TIME(HR) = .76 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .093; Ybar = .389
TOTAL AREA(ACRES)= 1585.9 UPSTREAM NODE OF LONGEST WATERCOURSE = 3180.0 WITH LENGTH = 22867.8 FEET
RAINFALL(INCH): 5M = .26; 30M = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03
DEPTH-AREA FACTORS: 5M = .93; 30M = .93; 1HR = .93; 3HR = .99; 6HR = .99; 24HR= 1.00
S-GRAPH : VALLEY = 100.0%; FOOTHILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = .0%
PEAK FLOW RATE(CFS)= 1077.17 TIME OF PEAK(HR) = 16.8 VOLUME(AF)= 273.43

											1096	.0020	11.8	Qpipe=1077.2cfs
														n=.0130 D= 9.1
3704.00					1.6									144.0"-PIPE

3704.00	MEMORY BANK # 1 CONFLUENCED WITH MAIN-STREAM													

UNIT HYDROGRAPH INFORMATION

Tc(MIN.) = 58.68 LAG TIME(HR) = .78 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .099; Ybar = .414
TOTAL AREA(ACRES)= 3027.8 UPSTREAM NODE OF LONGEST WATERCOURSE = 3180.0 WITH LENGTH = 23963.9 FEET
RAINFALL(INCH): 5M = .26; 30M = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03
DEPTH-AREA FACTORS: 5M = .86; 30M = .86; 1HR = .86; 3HR = .98; 6HR = .99; 24HR= .99
S-GRAPH : VALLEY = 100.0%; FOOTHILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = .0%
PEAK FLOW RATE(CFS)= 1886.77 TIME OF PEAK(HR) = 16.8 VOLUME(AF)= 504.26

3704.00	MEMORY BANK # 3 CLEARED													
3704.00	STORE HYDROLOGIC DATA TO A FILE													
					..						882	.0035	..	INITIAL SUBAREA
	.7		C	Com	----			.03			----	-----	----	
	.3		C	6D/AC	----			.13			----	-----	----	
3771.00	4.5	5.5	C	4D/AC	----	14.2	1.87	.15	.132	8.6	----	-----	----	

1-1-52

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 37

[ORANGE COUNTY]

FILE NAME:SA37.DAT
TIME/DATE OF STUDY: 10:46 2/23/1994
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES)

CALCULATED BY:
CHECKED BY:
PAGE NUMBER 16 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
											693	.0050	2.2	Qest.= 12.3cfs
64.ft-STREET FLOW TO PT.#	.4		C	Com	5.4			.03						D= .5 ,D*V= 1.1
3772.00	5.7	11.6	C	40/AC		19.6	1.49	.15	.137	14.2				FLOODWIDTH=16.4
											455	.0050	5.6	Qpipe= 14.2cfs
3773.00					1.3									n=.0130 D= 1.5
	7.7		C	60/AC				.13						24.0"-PIPE
3773.00	.3	19.7	C	40/AC		20.9	1.43	.15	.132	23.1				ADD SUBAREA
											1056	.0050	6.4	Qpipe= 23.1cfs
3774.00					2.7									n=.0130 D= 1.7
3774.00	13.2	32.9	C	60/AC		23.7	1.35	.13	.129	36.1				30.0"-PIPE
														ADD SUBAREA
											1219	.0050	7.0	Qpipe= 36.1cfs
3775.00					2.9									n=.0130 D= 2.2
	14.5		C	Com				.03						33.0"-PIPE
3775.00	8.3	55.8	C	60/AC		26.6	1.26	.13	.102	58.2				ADD SUBAREA
											454	.0010	4.3	Qpipe= 58.2cfs
3776.00					1.7									n=.0130 D= 3.5
	.2		C	Com				.03						54.0"-PIPE
3776.00	6.7	62.7	C	60/AC		28.3	1.21	.13	.104	62.4				ADD SUBAREA
											338	.0010	4.5	Qpipe= 62.4cfs
3790.00					1.3									n=.0130 D= 3.5
	.1		C	Com				.03						57.0"-PIPE
3790.00	16.4	79.2	C	60/AC		29.6	1.17	.13	.108	75.8				ADD SUBAREA
3790.00	MAIN-STREAM COPIED ONTO MEMORY BANK # 2													
					..						812	.0035	..	INITIAL SUBAREA
	4.1		C	60/AC				.13						
3778.00	2.3	6.4	C	40/AC		17.6	1.63	.15	.134	8.6				

1-1-53

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 37

[ORANGE COUNTY]

FILE NAME:SA37.DAT — CALCULATED BY:
TIME/DATE OF STUDY: 10:46 2/23/1994 — CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) — PAGE NUMBER 17 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
											289	.0050	2.2	Qest.= 11.5cfs
48.ft-STREET														D= .5 ,D*V= 1.0
FLOW TO PT.#	2.8		C	6D/AC	2.3			.13						FLOODWIDTH=16.2
3779.00	2.0	11.2	C	4D/AC	----	19.9	1.47	.15	.135	13.4	----	-----	----	----------
											290	.0050	5.6	Qpipe= 13.4cfs
														n=.0130 D= 1.4
3780.00					.9									24.0"-PIPE
	4.4		C	6D/AC				.13						
3780.00	3.1	18.6	C	4D/AC	----	20.8	1.44	.15	.135	21.8	----	-----	----	ADD SUBAREA
											279	.0050	6.4	Qpipe= 21.8cfs
														n=.0130 D= 1.6
3781.00					.7									30.0"-PIPE
	10.6		C	6D/AC				.13						
3781.00	1.8	31.0	C	4D/AC	----	21.5	1.42	.15	.132	35.8	----	-----	----	ADD SUBAREA
3781.00		31.0			----	21.5	1.42			35.8	----	-----	----	FOR CONFLUENCE
					..						327	.0050	..	INITIAL SUBAREA
3783.00	4.2	4.2	C	6D/AC	----	11.4	2.06	.13	.125	7.4	----	-----	----	----------
											578	.0050	2.3	Qest.= 12.8cfs
48.ft-STREET														D= .5 ,D*V= 1.1
FLOW TO PT.#					4.5									FLOODWIDTH=16.9
3784.00	7.4	11.7	C	6D/AC	----	15.9	1.75	.13	.125	17.0	----	-----	----	----------
											547	.0050	6.0	Qpipe= 17.0cfs
														n=.0130 D= 1.5
3785.00					1.5									27.0"-PIPE
3785.00	9.0	20.6	C	6D/AC	----	17.4	1.64	.13	.125	28.2	----	-----	----	ADD SUBAREA
											298	.0020	4.7	Qpipe= 28.2cfs
														n=.0130 D= 2.4
3786.00					1.1									36.0"-PIPE
3786.00	9.3	29.9	C	6D/AC	----	18.5	1.57	.13	.125	38.8	----	-----	----	ADD SUBAREA
											812	.0020	5.1	Qpipe= 38.8cfs
														n=.0130 D= 2.6
3781.00					2.6									42.0"-PIPE

1-1-54

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 37

[ORANGE COUNTY]

FILE NAME:SA37.DAT — CALCULATED BY:
TIME/DATE OF STUDY: 10:46 2/23/1994 — CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) — PAGE NUMBER 18 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
CONFLUENCE ANALYSIS FOR POINT# 3781.00	PEAK FLOW RATE(CFS) = 74.3													
	TIME OF CONCENTRATION(MIN.) = 21.1													LARGEST CONFLUENCE Q= 74.3
	MEAN VALUES: Fp(IN/HR) = .250; Ap = .515; Fm(IN/HR) = .129													
	EFFECTIVE AREA(ACRES) = 60.37 TOTAL AREA(ACRES) = 60.93													
	Q(cfs)	Tc(min)	Fp(avg)	Ap(avg)	Fm(avg)	I(in/hr)	Ae(acres)	NODE						
	74.30	21.49	.250	.52	.129	1.42	60.93	3777.0						
	74.32	21.10	.250	.51	.129	1.43	60.37	3782.0						
											302	.0050	8.5	Qpipe= 74.3cfs
														n=.0130 D= 2.8
3787.00					.6									45.0"-PIPE
	10.0		C	6D/AC				.13						
3787.00	.2	70.5	C	4D/AC		21.7	1.41	.15	.128	81.3				ADD SUBAREA
											748	.0050	8.6	Qpipe= 81.3cfs
														n=.0130 D= 3.0
3788.00					1.5									45.0"-PIPE
3788.00	13.6	84.1	C	6D/AC		23.1	1.37	.13	.128	93.7				ADD SUBAREA
											465	.0050	9.0	Qpipe= 93.7cfs
														n=.0130 D= 3.1
3789.00					.9									48.0"-PIPE
3789.00	9.4	93.5	C	6D/AC		24.0	1.34	.13	.127	102.0				ADD SUBAREA
											1352	.0050	9.2	Qpipe= 102.0cfs
														n=.0130 D= 3.1
3790.00					2.4									51.0"-PIPE
3790.00	MEMORY BANK # 2 CONFLUENCED WITH MAIN-STREAM													
	Q(cfs)	Tc(min)	Fp(avg)	Ap(avg)	Fm(avg)	I(in/hr)	Ae(acres)	NODE						
	175.76	26.44	.250	.48	.119	1.27	164.21	3782.0						
	175.72	26.83	.250	.48	.119	1.26	165.83	3777.0						
	169.96	29.60	.250	.47	.119	1.17	173.24	3770.0						
	TOTAL AREA(ACRES)= 173.24													

1-1-55

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 37

[ORANGE COUNTY]

FILE NAME:SA37.DAT | CALCULATED BY:
TIME/DATE OF STUDY: 10:46 2/23/1994 | CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) | PAGE NUMBER 19 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
											534	.0010	5.7	Qpipe= 175.8cfs
														n=.0130 D= 5.4
3795.00					1.6									81.0"-PIPE
	15.6		C	6D/AC				.13						
3795.00	3.2	183.0	C	Park		28.0	1.22	.21	.121	180.9				ADD SUBAREA
3795.00		183.0				28.0	1.22			180.9				FOR CONFLUENCE
					..						929	.0050	..	INITIAL SUBAREA
3792.00	6.4	6.4	C	6D/AC		17.3	1.65	.13	.125	8.7				
											669	.0050	2.2	Qest.= 12.5cfs
48.ft-STREET														D= .5 ,D*V= 1.0
FLOW TO PT.#	4.6		C	6D/AC	5.2			.13						FLOODWIDTH=16.7
3793.00	2.1	13.1	C	Park		22.5	1.39	.21	.139	14.7				
											601	.0020	4.1	Qpipe= 14.7cfs
														n=.0130 D= 1.7
3794.00					2.5									30.0"-PIPE
	15.9		C	6D/AC				.13						
3794.00	3.9	32.9	C	Park		25.0	1.31	.21	.141	34.6				ADD SUBAREA
											1691	.0050	7.0	Qpipe= 34.6cfs
														n=.0130 D= 2.1
3795.00					4.0									33.0"-PIPE

CONFLUENCE ANALYSIS FOR POINT# 3795.00

PEAK FLOW RATE(CFS) = 215.3
TIME OF CONCENTRATION(MIN.) = 28.0
MEAN VALUES: Fp(IN/HR) = .250; Ap = .497; Fm(IN/HR) = .124
EFFECTIVE AREA(ACRES) = 214.72 TOTAL AREA(ACRES) = 224.88

LARGEST CONFLUENCE Q= 215.3

Q(cfs)	Tc(min)	Fp(avg)	Ap(avg)	Fm(avg)	I(in/hr)	Ae(acres)	NODE
215.31	28.00	.250	.50	.124	1.22	214.72	3782.0
215.06	28.40	.250	.50	.124	1.21	216.79	3777.0
209.13	31.17	.250	.49	.124	1.14	224.88	3770.0
214.24	29.00	.250	.50	.124	1.19	219.07	3791.0

1-1-56

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 37

[ORANGE COUNTY]

FILE NAME:SA37.DAT
TIME/DATE OF STUDY: 10:46 2/23/1994
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES)

CALCULATED BY:
CHECKED BY:
PAGE NUMBER 20 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
											590	.0010	6.0	Qpipe= 215.3cfs
3796.00					1.6									n=.0130 D= 5.9
	9.9		C	60/AC				.13						87.0"-PIPE
3796.00	5.6	230.3	C	Park	----	29.7	1.17	.21	.126	216.4	----	-----	----	ADD SUBAREA
											680	.0010	6.1	Qpipe= 216.4cfs
3704.00					1.9									n=.0130 D= 5.6
														90.0"-PIPE
3704.00	MEMORY BANK # 3 DEFINED AS FOLLOWS:													
	Q(cfs)	Tc(min)	Fm(in/hr)	Ybar	AREA(acres)									
	1886.77	58.68	.099	.41	3027.80									
3704.00	MEMORY BANK # 3 CONFLUENCED WITH MAIN-STREAM													

UNIT HYDROGRAPH INFORMATION

Tc(MIN.) = 58.68 LAG TIME(HR) = .78 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .101; Ybar = .422
TOTAL AREA(ACRES)= 3268.2 UPSTREAM NODE OF LONGEST WATERCOURSE = 3180.0 WITH LENGTH = 23963.9 FEET
RAINFALL(INCH): 5M = .26; 30M = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03
DEPTH-AREA FACTORS: 5M = .85; 30M = .85; 1HR = .85; 3HR = .98; 6HR = .99; 24HR= .99
S-GRAPH : VALLEY = 100.0%; FOOTHILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = .0%
PEAK FLOW RATE(CFS)= 2006.55 TIME OF PEAK(HR) = 16.8 VOLUME(AF)= 538.32

3704.00		3268.2			----	58.7				2006.5	----	-----	----	STREAM SUMMARY

TOTAL AREA(ACRES)= 3268.25 PEAK FLOW RATE(CFS)= 2006.55
TIME OF CONCENTRATION(MIN.)= 58.68 LAG TIME(HR)= .78 MEAN VALUES: Fm(IN/HR) = .101; Ybar = .422

1-1-57


City of Santa Ana
N
0
600
LEGEND
ANALYSIS NODE
STORM FLOW PATH
EXISTING STORM DRAIN
EXISTING RCB STORM DRAIN
EXISTING OPEN CHANNEL
EXISTING OPEN CHANNEL
DRAINAGE AREA BOUNDARY
BASIN BOUNDARY
CITY BOUNDARY
PROPOSED IMPROVEMENTS
NEW STORM DRAIN
PARALLEL STORM DRAIN
REPLACEMENT STORM DRAIN
DRAINAGE MAP
AREA 38
38
36
37
39
46
47
48
STANFORD
POMONA
BERKELEY
OCCIDENTAL
COMMERCIAL ST.
ANDREW
GERTRUDE
BORCHARD
MADISON PARK
ST. ANDREW PL.
GLENWOOD
PACIFIC
EASTWOOD
HATHAWAY ST.
MAYWOOD AV.
WARNER
RITCHEY
LYON
WRIGHT
SOUTHERN
FLORA ST.
CENTRAL
ADAMS
BROADWAY
BIRCH
SYCAMORE
CYPRESS
ORANGE
THOMAS EDISON
MAPLE
OAK
MINTER
KILSON
HICKORY
HALLADAY
CEDAR
EVERGREEN
STANDARD
RAILROAD
SANTA FE ST.
TRAILER PK.
MADISON AV.
JAMES MADISON
ELDER
EDINGER
HOOD
MINNIE
BOUSSELOT
MONROE
PARK
BROOKHOLLOW DR.
PULLMAN
GRAND

ID	Roadway Name	Roadway Slope (ft/ft)	Roadway K	Existing Drain Diam/Depth (in)/ (ft)	Existing Drain Base Width (ft)	Existing Drain Side Slope	Existing Drain Slope (ft/ft)	Existing Drain K	Design Runoff (cfs)	Section Capacity Roadway (cfs)	Section Capacity Conduit (cfs)	Section Capacity Total (cfs)	Deficient Capacity (cfs)	Improvement Alternatives Replacement	Improvement Alternatives New/Parallel	Recommended Improvement
Map Area:38																
5504-3801	ROUSELLE	0.0050		51.0			0.00500	1692	804.8	0.0	119.6	119.6	685.1	11x6.5 RCB	10x6.5 RCB	11x6.5 RCB
5811-3812	HALLADAY	0.0050	566						10.9	40.0	0.0	40.0	0.0			
5812-3813	OCCIDENTAL	0.0050	283						10.9	20.0	0.0	20.0	0.0			
5813-3801	OCCIDENTAL	0.0050	283						15.8	20.0	0.0	20.0	0.0			
5801-3802	ROUSELLE	0.0050	566	51.0			0.00500	1692	807.2	40.0	119.6	159.7	647.5	11x6.5 RCB	9.5x6.5 RCB	11x6.5 RCB
5802-3803	ROUSELLE	0.0050	566	51.0			0.00500	1692	816.4	40.0	119.6	159.7	656.7	11x6.5 RCB	9.5x6.5 RCB	11x6.5 RCB
5816-3817	ST. GERTRUDE	0.0020	283						14.7	12.7	0.0	12.7	2.0		18" RCP	18" RCP
5817-3818	ST. GERTRUDE	0.0020	283						14.7	12.7	0.0	12.7	2.0		18" RCP	18" RCP
5818-3803	ST. GERTRUDE	0.0020	283						22.2	12.7	0.0	12.7	9.5		24" RCP	24" RCP
5803-3804	ROUSELLE	0.0050	566	51.0			0.00500	1692	829.7	40.0	119.6	159.7	670.1	11x6.5 RCB	9.5x6.5 RCB	11x6.5 RCB
5804-3805	ROUSELLE	0.0050		51.0			0.00500	1692	830.3	0.0	119.6	119.6	710.7	11.5x6.5 RCB	10x6.5 RCB	11.5x6.5 RCB
5821-3822	STANDARD	0.0050	566						68.6	40.0	0.0	40.0	28.6		30" RCP	33" RCP
5822-3823	STANDARD	0.0050	566						79.1	40.0	0.0	40.0	39.0		36" RCP	36" RCP
5823-3824	STANDARD	0.0050	566						87.7	40.0	0.0	40.0	47.7		39" RCP	39" RCP
5824-3825	STANDARD	0.0050	566						102.7	40.0	0.0	40.0	62.7		42" RCP	42" RCP
5825-3826	STANDARD	0.0050	566						112.2	40.0	0.0	40.0	72.2		45" RCP	45" RCP
5826-3834	WARNER	0.0020	70	27.0			0.00200	310	121.7	3.1	13.9	17.0	104.8	63" RCP	60" RCP	63" RCP
5831-3832	EVERGREEN	0.0050	566						12.5	40.0	0.0	40.0	0.0			
5832-3833	EVERGREEN	0.0050	566						12.5	40.0	0.0	40.0	0.0			
5833-3834	EVERGREEN	0.0050	566						18.6	40.0	0.0	40.0	0.0			
5834-3845	WARNER	0.0020	70	27.0			0.00200	310	148.1	3.1	13.9	17.0	131.1	66" RCP	63" RCP	66" RCP
5841-3842	CEDAR	0.0050	566						17.9	40.0	0.0	40.0	0.0			
5842-3843	CEDAR	0.0050	566						17.9	40.0	0.0	40.0	0.0			
5843-3844	ST. GERGTRUDE	0.0020	566						24.8	25.3	0.0	25.3	0.0			
5844-3845	HALLADAY	0.0050	566						30.8	40.0	0.0	40.0	0.0			
5845-3805	WARNER	0.0020	70	27.0			0.00200	310	190.0	3.1	13.9	17.0	173.0	72" RCP	72" RCP	72" RCP
5594-3821	STANDARD	0.0050	566						58.9	40.0	0.0	40.0	18.9		27" RCP	33" RCP

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 38

[ORANGE COUNTY]

FILE NAME:SA38.DAT — CALCULATED BY:
TIME/DATE OF STUDY: 10:45 2/23/1994 — CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) — PAGE NUMBER 1 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (AVg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
3504.00	MEMORY BANK # 1 DEFINED AS FOLLOWS:													
	Q(cfs)	Tc(min)	Fm(in/hr)	Ybar	AREA(acres)									
	804.78	48.60	.093	.38	1061.12									
3504.00	MEMORY BANK # 1 COPIED ONTO MAIN-STREAM													
	Q(cfs)	Tc(min)	Fm(in/hr)	Ybar	AREA(acres)									
	804.78	48.60	.093	.38	1061.12									
											1206	.0050	15.4	Qpipe= 804.8cfs
														n=.0130 D= 6.9
3801.00				1.3										108.0"-PIPE
3801.00	19.3	1080.4	C	60/AC		49.9	.87	.13	.094	804.8				ADD SUBAREA

UNIT HYDROGRAPH INFORMATION

Tc(MIN.) = 49.91 LAG TIME(HR) = .67 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .094; Ybar = .380
TOTAL AREA(ACRES)= 1080.4 UPSTREAM NODE OF LONGEST WATERCOURSE = 3180.0 WITH LENGTH = 17140.0 FEET
RAINFALL(INCH): 5M = .26; 30M = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03
DEPTH-AREA FACTORS: 5M = .95; 30M = .95; 1HR = .95; 3HR = .99; 6HR = 1.00; 24HR= 1.00
S-GRAPH : VALLEY = 100.0%; FOOTHILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = .0%
PEAK FLOW RATE(CFS)= 804.78 TIME OF PEAK(HR) = 16.8 VOLUME(AF)= 188.09

3801.00		1080.4				49.9	.87			804.8				FOR CONFLUENCE
					..						833	.0010	..	INITIAL SUBAREA
3811.00	5.9	5.9	C	60/AC		22.8	1.38	.13	.125	6.7				
											308	.0050	2.1	Qest.= 9.0cfs
48.ft-STREET														D= .4 ,D*V= .9
FLOW TO PT.#					2.6									FLOODWIDTH=14.7
3812.00	4.4	10.3	C	60/AC		25.4	1.30	.13	.125	10.9				
											859	.0050	5.4	Qpipe= 10.9cfs
														n=.0130 D= 1.2
3813.00					2.7									24.0"-PIPE
3813.00	5.7	16.1	C	60/AC		28.1	1.22	.13	.125	15.8				ADD SUBAREA

1-1-60

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 38

[ORANGE COUNTY]

FILE NAME:SA38.DAT | CALCULATED BY:
TIME/DATE OF STUDY: 10:45 2/23/1994 | CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) | PAGE NUMBER 2 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
											685	.0050	5.9	Qpipe= 15.8cfs
														n=.0130 D= 1.4
3801.00					1.9									27.0"-PIPE

CONFLUENCE ANALYSIS FOR POINT# 3801.00
PEAK FLOW RATE(CFS) = 807.2
TIME OF CONCENTRATION(MIN.) = 49.9 LAG TIME(HR) = .67
MEAN VALUES: Fm(IN/HR) = .094; Ybar = .384
TOTAL AREA(ACRES) = 1096.49

UNIT HYDROGRAPH INFORMATION

Tc(MIN.) = 49.91 LAG TIME(HR) = .67 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .094; Ybar = .384
TOTAL AREA(ACRES)= 1096.5 UPSTREAM NODE OF LONGEST WATERCOURSE = 3180.0 WITH LENGTH = 17140.0 FEET
RAINFALL(INCH): 5M = .26; 30M = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03
DEPTH-AREA FACTORS: 5M = .95; 30M = .95; 1HR = .95; 3HR = .99; 6HR = 1.00; 24HR= 1.00
S-GRAPH : VALLEY = 100.0%; FOOTHILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = .0%
PEAK FLOW RATE(CFS)= 807.20 TIME OF PEAK(HR) = 16.8 VOLUME(AF)= 190.13

											518	.0050	15.4	Qpipe= 807.2cfs
														n=.0130 D= 6.9
3802.00					.6									108.0"-PIPE
3802.00	12.1	1108.6	C	6D/AC		50.5	.87	.13	.094	816.4				ADD SUBAREA

UNIT HYDROGRAPH INFORMATION

Tc(MIN.) = 50.47 LAG TIME(HR) = .67 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .094; Ybar = .385
TOTAL AREA(ACRES)= 1108.6 UPSTREAM NODE OF LONGEST WATERCOURSE = 3180.0 WITH LENGTH = 17658.5 FEET
RAINFALL(INCH): 5M = .26; 30M = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03
DEPTH-AREA FACTORS: 5M = .95; 30M = .95; 1HR = .95; 3HR = .99; 6HR = 1.00; 24HR= 1.00
S-GRAPH : VALLEY = 100.0%; FOOTHILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = .0%
PEAK FLOW RATE(CFS)= 816.37 TIME OF PEAK(HR) = 16.8 VOLUME(AF)= 192.06

											986	.0050	15.4	Qpipe= 816.4cfs
														n=.0130 D= 7.0
3803.00					1.1									108.0"-PIPE

1-1-61

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 38

[ORANGE COUNTY]

FILE NAME:SA38.DAT | CALCULATED BY:
TIME/DATE OF STUDY: 10:45 2/23/1994 | CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) | PAGE NUMBER 3 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
3803.00	4.1	1112.7	C	6D/AC	----	51.5	.86	.13	.094	817.0	----	-----	----	ADD SUBAREA

UNIT HYDROGRAPH INFORMATION

Tc(MIN.) = 51.54 LAG TIME(HR) = .69 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .094; Ybar = .386
TOTAL AREA(ACRES)= 1112.7 UPSTREAM NODE OF LONGEST WATERCOURSE = 3180.0 WITH LENGTH = 18645.1 FEET
RAINFALL(INCH): 5M = .26; 30M = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03
DEPTH-AREA FACTORS: 5M = .95; 30M = .95; 1HR = .95; 3HR = .99; 6HR = 1.00; 24HR= 1.00
S-GRAPH : VALLEY = 100.0%; FOOTHILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = .0%
PEAK FLOW RATE(CFS)= 817.04 TIME OF PEAK(HR) = 16.8 VOLUME(AF)= 192.54

3803.00		32.3			----	51.5	.86			817.0	----	-----	----	FOR CONFLUENCE
					..						970	.0050	..	INITIAL SUBAREA
3816.00	6.4	6.4	C	6D/AC	----	17.6	1.63	.13	.125	8.7	----	-----	----	
48.ft-STREET											263	.0020	1.7	Qest.= 12.2cfs
FLOW TO PT.#					2.7									D= .6 ,D*V= 1.0
3817.00	5.8	12.3	C	6D/AC	----	20.2	1.45	.13	.125	14.7	----	-----	----	FLOODWIDTH=29.3
											280	.0020	4.1	Qpipe= 14.7cfs
														n=.0130 D= 1.7
3818.00					1.1									30.0"-PIPE
3818.00	6.8	19.1	C	6D/AC	----	21.4	1.42	.13	.125	22.2	----	-----	----	ADD SUBAREA
											298	.0020	4.4	Qpipe= 22.2cfs
														n=.0130 D= 2.2
3803.00					1.1									33.0"-PIPE

1-1-62

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 38

[ORANGE COUNTY]

FILE NAME:SA38.DAT — CALCULATED BY:
TIME/DATE OF STUDY: 10:45 2/23/1994 — CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) — PAGE NUMBER 4 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
CONFLUENCE ANALYSIS FOR POINT# 3803.00	PEAK FLOW RATE(CFS) = 829.7													
	TIME OF CONCENTRATION(MIN.) = 51.5 LAG TIME(HR) = .69													
	MEAN VALUES: Fm(IN/HR) = .095; Ybar = .389													
	TOTAL AREA(ACRES) = 1131.80													
	UNIT HYDROGRAPH INFORMATION													
	Tc(MIN.) = 51.54 LAG TIME(HR) = .69 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .095; Ybar = .389													
	TOTAL AREA(ACRES)= 1131.8 UPSTREAM NODE OF LONGEST WATERCOURSE = 3180.0 WITH LENGTH = 18645.1 FEET													
	RAINFALL(INCH): 5M = .26; 30M = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03													
	DEPTH-AREA FACTORS: 5M = .95; 30M = .95; 1HR = .95; 3HR = .99; 6HR = 1.00; 24HR= 1.00													
	S-GRAPH : VALLEY = 100.0%; FOOTHILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = .0%													
	PEAK FLOW RATE(CFS)= 829.74 TIME OF PEAK(HR) = 16.8 VOLUME(AF)= 195.24													
											668	.0050	15.4	Qpipe= 829.7cfs
														n=.0130 D= 7.1
3804.00					.7									108.0"-PIPE
3804.00	7.2	1139.0	C	6D/AC		52.3	.85	.13	.095	830.3				ADD SUBAREA
	UNIT HYDROGRAPH INFORMATION													
	Tc(MIN.) = 52.27 LAG TIME(HR) = .70 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .095; Ybar = .389													
	TOTAL AREA(ACRES)= 1139.0 UPSTREAM NODE OF LONGEST WATERCOURSE = 3180.0 WITH LENGTH = 19314.0 FEET													
	RAINFALL(INCH): 5M = .26; 30M = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03													
	DEPTH-AREA FACTORS: 5M = .95; 30M = .95; 1HR = .95; 3HR = .99; 6HR = 1.00; 24HR= 1.00													
	S-GRAPH : VALLEY = 100.0%; FOOTHILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = .0%													
	PEAK FLOW RATE(CFS)= 830.29 TIME OF PEAK(HR) = 16.8 VOLUME(AF)= 196.39													
											665	.0050	15.4	Qpipe= 830.3cfs
														n=.0130 D= 7.1
3805.00					.7									108.0"-PIPE

1-1-63

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 38

[ORANGE COUNTY]

FILE NAME:SA38.DAT | CALCULATED BY:
TIME/DATE OF STUDY: 10:45 2/23/1994 | CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) | PAGE NUMBER 5 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
3805.00	23.9	1162.9	C	6D/AC		53.0	.85	.13	.096	840.1				ADD SUBAREA

UNIT HYDROGRAPH INFORMATION

Tc(MIN.) = 52.99 LAG TIME(HR) = .71 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .096; Ybar = .390
TOTAL AREA(ACRES)= 1162.9 UPSTREAM NODE OF LONGEST WATERCOURSE = 3180.0 WITH LENGTH = 19979.5 FEET
RAINFALL(INCH): 5M = .26; 30M = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03
DEPTH-AREA FACTORS: 5M = .95; 30M = .95; 1HR = .95; 3HR = .99; 6HR = 1.00; 24HR= 1.00
S-GRAPH : VALLEY = 100.0%; FOOTHILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = .0%
PEAK FLOW RATE(CFS)= 840.10 TIME OF PEAK(HR) = 16.8 VOLUME(AF)= 200.10

3805.00	MAIN-STREAM COPIED ONTO MEMORY BANK # 2													
3594.00	MEMORY BANK # 3 DEFINED AS FOLLOWS:													
	Q(cfs)	Tc(min)	Fp(avg)	Ap(avg)	Fm(avg)	I(in/hr)	Ae(acres)	NODE						
	58.88	22.64	.250	.38	.094	1.38	50.84	3590.0						
	TOTAL AREA(ACRES)= 50.84													
3594.00	MEMORY BANK # 3 COPIED ONTO MAIN-STREAM													
	Q(cfs)	Tc(min)	Fp(avg)	Ap(avg)	Fm(avg)	I(in/hr)	Ae(acres)	NODE						
	58.88	22.64	.250	.38	.094	1.38	50.84	3590.0						
	TOTAL AREA(ACRES)= 50.84													
											400	.0050	8.1	Qpipe= 58.9cfs
														n=.0130 D= 2.5
3821.00					.8									42.0"-PIPE
	8.8		C	Com				.03						
3821.00	.2	59.9	C	6D/AC		23.5	1.36	.13	.084	68.6				ADD SUBAREA
											694	.0050	8.2	Qpipe= 68.6cfs
														n=.0130 D= 2.8
3822.00					1.4									42.0"-PIPE
	10.7		C	Com				.03						
3822.00	.3	70.9	C	6D/AC		24.9	1.31	.13	.075	79.1				ADD SUBAREA

1-1-64

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 38

[ORANGE COUNTY]

FILE NAME:SA38.DAT
TIME/DATE OF STUDY: 10:45 2/23/1994
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES)

CALCULATED BY:
CHECKED BY:
PAGE NUMBER 6 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
											513	.0050	8.6	Qpipe= 79.1cfs
														n=.0130 D= 2.9
3823.00					1.0									45.0"-PIPE
	7.5		C	Com				.03						
3823.00	2.0	80.4	C	6D/AC		25.9	1.28	.13	.072	87.7				ADD SUBAREA
											1005	.0050	8.9	Qpipe= 87.7cfs
														n=.0130 D= 2.9
3824.00					1.9									48.0"-PIPE
	14.1		C	Com				.03						
3824.00	3.9	98.3	C	6D/AC		27.8	1.23	.13	.067	102.7				ADD SUBAREA
											684	.0050	9.3	Qpipe= 102.7cfs
														n=.0130 D= 3.1
3825.00					1.2									51.0"-PIPE
	9.8		C	Com				.03						
3825.00	2.6	110.7	C	6D/AC		29.0	1.19	.13	.065	112.2				ADD SUBAREA
											632	.0050	9.3	Qpipe= 112.2cfs
														n=.0130 D= 3.4
3826.00					1.1									51.0"-PIPE
	10.2		C	Com				.03						
3826.00	2.6	123.5	C	6D/AC		30.1	1.16	.13	.063	121.7				ADD SUBAREA
											347	.0020	6.8	Qpipe= 121.7cfs
														n=.0130 D= 4.1
3834.00					.9									63.0"-PIPE
3834.00	10.3	133.8	C	6D/AC		31.0	1.14	.13	.068	129.6				ADD SUBAREA
3834.00		133.8				31.0	1.14			129.6				FOR CONFLUENCE
					..						826	.0050	..	INITIAL SUBAREA
3831.00	5.1	5.1	C	6D/AC		16.5	1.71	.13	.125	7.2				
											922	.0050	2.1	Qest.= 10.7cfs
48.ft-STREET														D= .4 ,D*V= .9
FLOW TO PT.#					7.4									FLOODWIDTH=15.7
3832.00	6.3	11.4	C	6D/AC		23.9	1.34	.13	.125	12.5				

1-1-65

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 38

[ORANGE COUNTY]

FILE NAME:SA38.DAT | CALCULATED BY:
TIME/DATE OF STUDY: 10:45 2/23/1994 | CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) | PAGE NUMBER 7 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
											995	.0050	5.5	Qpipe= 12.5cfs
														n=.0130 D= 1.4
3833.00					3.0									24.0"-PIPE
3833.00	7.0	18.4	C	60/AC		26.9	1.25	.13	.125	18.6				ADD SUBAREA
											1315	.0050	6.1	Qpipe= 18.6cfs
														n=.0130 D= 1.6
3834.00					3.6									27.0"-PIPE
CONFLUENCE ANALYSIS FOR POINT# 3834.00	PEAK FLOW RATE(CFS) = 148.1 TIME OF CONCENTRATION(MIN.) = 31.0 MEAN VALUES: Fp(IN/HR) = .250; Ap = .298; Fm(IN/HR) = .074 EFFECTIVE AREA(ACRES) = 152.20 TOTAL AREA(ACRES) = 152.20													LARGEST CONFLUENCE Q= 148.1

Q(cfs)	Tc(min)	Fp(avg)	Ap(avg)	Fm(avg)	I(in/hr)	Ae(acres)	NODE
148.10	30.97	.250	.30	.074	1.14	152.20	3590.0
147.30	30.54	.250	.30	.075	1.15	150.32	3830.0

											654	.0020	7.2	Qpipe= 148.1cfs
														n=.0130 D= 4.3
3845.00					1.5									69.0"-PIPE
	19.3		C	60/AC				.13						
3845.00	.0	171.5	C	Park		32.5	1.12	.21	.080	160.1				ADD SUBAREA
3845.00		171.5				32.5	1.12			160.1				FOR CONFLUENCE
					..						835	.0050	..	INITIAL SUBAREA
3841.00	5.4	5.4	C	60/AC		16.6	1.70	.13	.125	7.6				
											923	.0050	2.3	Qest.= 13.6cfs
48.ft-STREET FLOW TO PT.#														D= .5 ,D*V= 1.1
					7.0									FLOODWIDTH=17.3
3842.00	10.8	16.2	C	60/AC		23.6	1.35	.13	.125	17.9				
											972	.0050	6.0	Qpipe= 17.9cfs
														n=.0130 D= 1.6
3843.00					2.7									27.0"-PIPE
3843.00	7.8	24.0	C	60/AC		26.3	1.27	.13	.125	24.8				ADD SUBAREA

1-1-66

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 38

[ORANGE COUNTY]

FILE NAME:SA38.DAT — CALCULATED BY:
TIME/DATE OF STUDY: 10:45 2/23/1994 — CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) — PAGE NUMBER 8 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
											316	.0020	4.6	Qpipe= 24.8cfs
														n=.0130 D= 2.1
3844.00					1.1									36.0"-PIPE
3844.00	6.7	30.7	C	6D/AC	----	27.4	1.24	.13	.125	30.8	----	-----	----	ADD SUBAREA
											1321	.0050	6.9	Qpipe= 30.8cfs
														n=.0130 D= 1.9
3845.00					3.2									33.0"-PIPE

CONFLUENCE ANALYSIS FOR POINT# 3845.00

PEAK FLOW RATE(CFS) = 190.0
TIME OF CONCENTRATION(MIN.) = 32.5
MEAN VALUES: Fp(IN/HR) = .250; Ap = .348; Fm(IN/HR) = .087
EFFECTIVE AREA(ACRES) = 202.26 TOTAL AREA(ACRES) = 202.26

Q(cfs)	Tc(min)	Fp(avg)	Ap(avg)	Fm(avg)	I(in/hr)	Ae(acres)	NODE
189.55	32.06	.250	.35	.087	1.13	200.38	3830.0
189.98	32.49	.250	.35	.087	1.12	202.26	3590.0
186.69	30.62	.250	.35	.087	1.15	192.76	3840.0

LARGEST CONFLUENCE Q= 190.0

											1124	.0020	7.6	Qpipe= 190.0cfs
														n=.0130 D= 4.7
3805.00					2.5									75.0"-PIPE
3805.00	MEMORY BANK # 3 CONFLUENCED WITH MAIN-STREAM													

UNIT HYDROGRAPH INFORMATION

Tc(MIN.) = 52.99 LAG TIME(HR) = .71 TIME INTERVAL(MIN.) = 5.0 Fm(IN/HR) = .094; Ybar = .391
TOTAL AREA(ACRES)= 1365.1 UPSTREAM NODE OF LONGEST WATERCOURSE = 3180.0 WITH LENGTH = 19979.5 FEET
RAINFALL(INCH): 5M = .26; 30M = .59; 1HR = .78; 3HR = 1.31; 6HR = 1.81; 24HR= 3.03
DEPTH-AREA FACTORS: 5M = .94; 30M = .94; 1HR = .94; 3HR = .99; 6HR = 1.00; 24HR= 1.00
S-GRAPH : VALLEY = 100.0%; FOOTHILL = .0%; MOUNTAIN = .0%; VALLEY(UNDEV)/DESERT = .0%
PEAK FLOW RATE(CFS)= 978.92 TIME OF PEAK(HR) = 16.8 VOLUME(AF)= 234.78

3805.00	STORE HYDROLOGIC DATA TO A FILE													

1-1-67

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 38

[ORANGE COUNTY]

FILE NAME:SA38.DAT | CALCULATED BY:
TIME/DATE OF STUDY: 10:45 2/23/1994 | CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) | PAGE NUMBER 9 OF

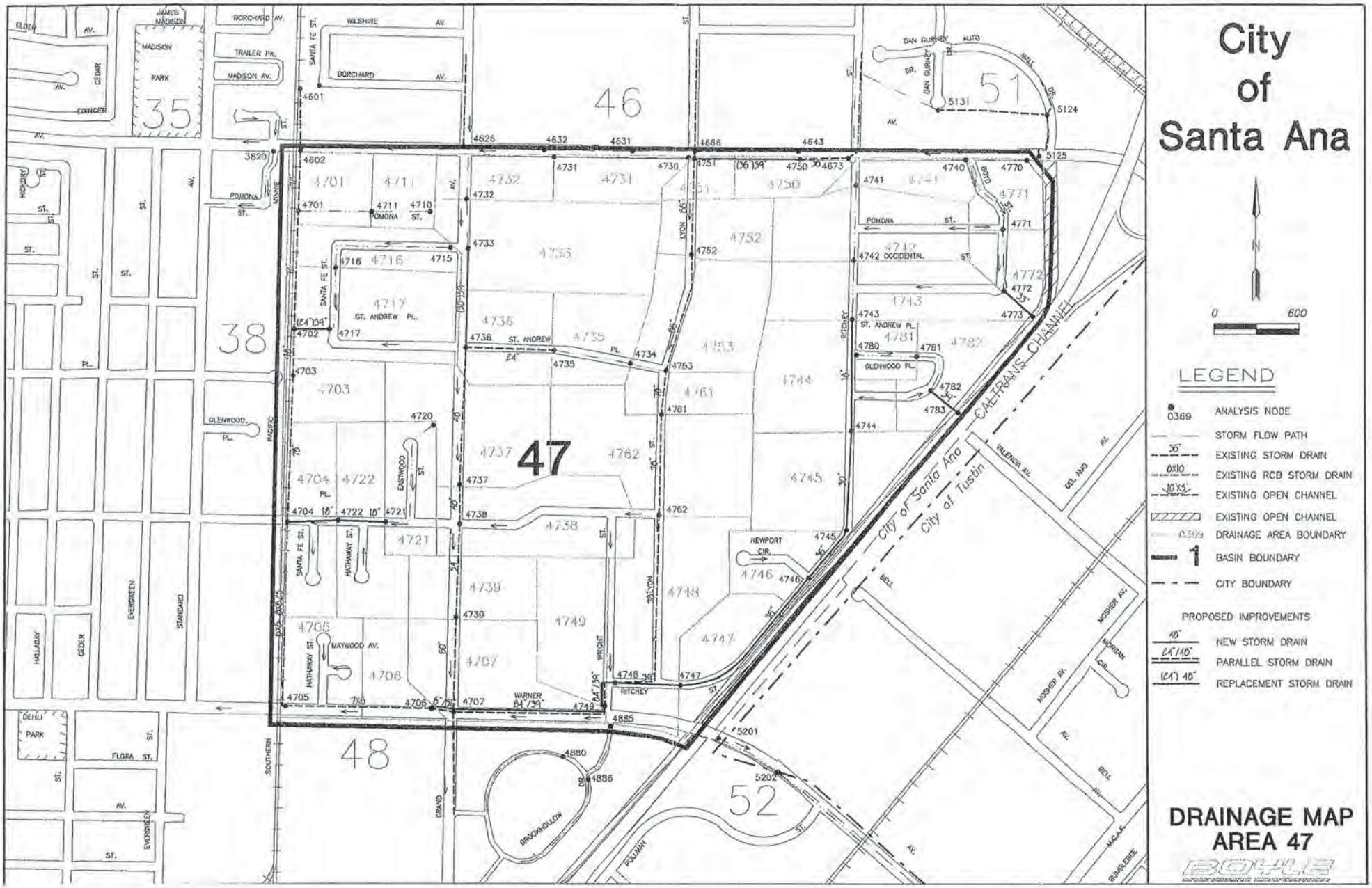
[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	AREA (ACRES) SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
3805.00		1365.1				53.0				978.9				STREAM SUMMARY

TOTAL AREA(ACRES)= 1365.15 PEAK FLOW RATE(CFS)= 978.92

TIME OF CONCENTRATION(MIN.)= 52.99 LAG TIME(HR)= .71 MEAN VALUES: Fm(IN/HR) = .094; Ybar = .391

1-1-68


City of Santa Ana
0 600
LEGEND
0369 ANALYSIS NODE
STORM FLOW PATH
36" EXISTING STORM DRAIN
6X10 EXISTING RCB STORM DRAIN
10'X5' EXISTING OPEN CHANNEL
EXISTING OPEN CHANNEL
0369 DRAINAGE AREA BOUNDARY
1 BASIN BOUNDARY
CITY BOUNDARY
PROPOSED IMPROVEMENTS
48" NEW STORM DRAIN
2A-48" PARALLEL STORM DRAIN
(2A)-48" REPLACEMENT STORM DRAIN
DRAINAGE MAP
AREA 47
BOYLE
CALTRANS CHANNEL
City of Santa Ana
City of Tustin
46
47
48
51
52
35
38

ID	Roadway Name	Roadway Slope (ft/ft)	Roadway K	Existing Drain Diam/Depth (in)/ (ft)	Existing Drain Base Width (ft)	Existing Drain Side Slope	Existing Drain Slope (ft/ft)	Existing Drain K	Design Runoff (cfs)	Section Capacity Roadway (cfs)	Section Capacity Conduit (cfs)	Section Capacity Total (cfs)	Deficient Capacity (cfs)	Improvement Alternatives Replacement	Improvement Alternatives New/Parallel	Recommended Improvement
Map Area:47																
4602-4701	RXR	0.0050		72.0			0.00540	4244	273.3	0.0	311.9	311.9	0.0			
4711-4701	ALLEY HOBLS	0.0020	566						17.8	25.3	0.0	25.3	0.0			
4701-4702	RXR	0.0050		72.0			0.00635	4244	287.4	0.0	338.2	338.2	0.0			
4716-4717	SANTA FE	0.0050	566						34.6	40.0	0.0	40.0	0.0			
4717-4702	ESMT	0.0020		24.0			0.00200	227	34.6	0.0	10.2	10.2	24.4	39" RCP	36" RCP	39" RCP
4702-4703	RXR	0.0050		78.0			0.00480	5254	318.1	0.0	364.0	364.0	0.0			
4703-4704	RXR	0.0050		78.0			0.00500	5254	318.1	0.0	371.5	371.5	0.0			
4721-4722	ST. GERTRUDE	0.0020	566						28.5	25.3	0.0	25.3	3.2		18" RCP	18" RCP
4722-4704	ST. GERTRUDE	0.0020	566						28.5	25.3	0.0	25.3	3.2		18" RCP	18" RCP
4704-4705	RXR	0.0050		6.0	6.		0.00600	6550	342.0	0.0	507.4	507.4	0.0			
4705-4706	WARNER	0.0010		6.0	8.		0.00360	9862	342.0	0.0	591.7	591.7	0.0			
4706-4707	WARNER	0.0010		6.0	7.		0.00100	9336	342.0	0.0	295.2	295.2	46.8	11x6.5 RCB	51" RCP	51" RCP
4731-4732	GRAND	0.0050	561						15.6	39.7	0.0	39.7	0.0			
4732-4733	GRAND	0.0050	561						15.6	39.7	0.0	39.7	0.0			
4733-4736	GRAND	0.0050	280	30.0			0.00100	411	41.3	19.8	13.0	32.8	8.5	39" RCP	27" RCP	39" RCP
4735-4736	ST. ANDREWS	0.0020	566	24.0			0.00240	227	15.6	25.3	11.1	36.4	0.0			
4736-4737	GRAND	0.0050	561	48.0			0.00500	1440	64.2	39.7	101.8	141.5	0.0			
4737-4738	GRAND	0.0050	561	48.0			0.00760	1440	81.9	39.7	125.5	165.2	0.0			
4738-4739	GROUND	0.0050	561	54.0			0.00500	1971	104.2	39.7	139.4	179.0	0.0			
4739-4707	GRAND	0.0050	561	60.0			0.00200	2610	111.3	39.7	116.7	156.4	0.0			
4741-4742	RITCHEY	0.0050	566						26.3	40.0	0.0	40.0	0.0			
4742-4743	RITCHEY	0.0050	566						26.3	40.0	0.0	40.0	0.0			
4743-4744	RITCHEY	0.0050	566						45.5	40.0	0.0	40.0	5.5		18" RCP	18" RCP
4744-4745	RITCHEY	0.0050	566						51.3	40.0	0.0	40.0	11.3		24" RCP	30" RCP
4745-4746	RITCHEY	0.0050	566						68.9	40.0	0.0	40.0	28.8		30" RCP	36" RCP
4746-4747	RITCHEY	0.0050	566						76.1	40.0	0.0	40.0	36.1		33" RCP	36" RCP
4747-4748	RITCHEY	0.0050	566						81.8	40.0	0.0	40.0	41.8		36" RCP	39" RCP
4673-4750	EDINGER	0.0020		36.0			0.00780	668	34.3	0.0	59.0	59.0	0.0			
4750-4751	EDINGER	0.0020		36.0			0.00320	668	40.5	0.0	37.8	37.8	2.8	39" RCP	18" RCP	39" RCP
4666-4751	LYON/EDINGER	0.0035		48.0			0.00600	1440	147.0	0.0	111.5	111.5	35.4	54" RCP	33" RCP	54" RCP
4751-4752	LYON	0.0050	566	66.0			0.00480	3365	183.7	40.0	233.1	273.2	0.0			
4752-4753	LYON	0.0050	566	66.0			0.00760	3365	183.7	40.0	293.4	333.4	0.0			
4753-4761	LYON	0.0050	566	78.0			0.00500	5254	213.3	40.0	371.5	411.5	0.0			
4761-4762	LYON	0.0050	566	78.0			0.00500	5254	217.6	40.0	371.5	411.5	0.0			
4762-4748	LYON	0.0050	566	78.0			0.00500	5254	241.1	40.0	371.5	411.5	0.0			
4748-4749	WRIGHT	0.0050	566	84.0			0.00200	6402	340.0	40.0	286.3	326.3	13.7	7.5x6.5 RCB	27" RCP	39" RCP**
4749-4707	WARNER	0.0020	561	84.0			0.00200	6402	349.9	25.1	286.3	311.4	38.5	8x6.5 RCB	42" RCP	39" RCP**
4771-4772	BOYD	0.0050	566						16.5	40.0	0.0	40.0	0.0			
4772-4773	FWY	0.0010							16.5	0.0	0.0	0.0	16.5		33" RCP	33" RCP
4781-4782	GLENWOOD	0.0050	566						21.2	40.0	0.0	40.0	0.0			
4782-4783	GLENWOOD	0.0010							21.2	0.0	0.0	0.0	21.2		39" RCP	39" RCP
4755-4756	ST. ANDREWS	0.0020	566	27.0			0.00200	310	9.3	25.3	13.9	39.2	0.0			
4756-4753	ST. ANDREWS	0.0020	566	36.0			0.00200	668	14.0	25.3	29.9	55.2	0.0			

Note: * indicates Parallel System

ID	Description	COST ESTIMATE Quantity	Unit	Rate ($/Unit)	Amount ($)
Map Area:47					
4666-4751	54" RCP	53	LF	182	9,662
4706-4707	51" RCP	158	LF	174	27,486
4717-4702	39" RCP	247	LF	138	34,203
4721-4722	18" RCP	331	LF	77	25,461
4722-4704	18" RCP	356	LF	77	27,359
4733-4736	39" RCP	698	LF	138	96,520
4743-4744	18" RCP	782	LF	77	60,104
4744-4745	30" RCP	701	LF	112	78,483
4745-4746	36" RCP	431	LF	130	55,871
4746-4747	36" RCP	1226	LF	130	158,879
4747-4748	39" RCP	470	LF	138	65,029
4748-4749	39" RCP	234	LF	138	32,349
4749-4707	39" RCP	1120	LF	138	154,894
4750-4751	39" RCP	747	LF	138	103,286
4772-4773	33" RCP	272	LF	121	32,828
4782-4783	39" RCP	245	LF	138	33,829
				Subtotal	$996,242
	Engineering and Administrative (20%)				199,248
				Total	1,195,490
				Total	1,195,490

1-1-71

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 47

[ORANGE COUNTY]

FILE NAME:SA47.DAT — CALCULATED BY:
TIME/DATE OF STUDY: 12:12 10/29/1993 — CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) — PAGE NUMBER 1 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
4602.00	MEMORY BANK # 1 DEFINED AS FOLLOWS:													

Q(cfs)	Tc(min)	Fp(avg)	Ap(avg)	Fm(avg)	I(in/hr)	Ae(acres)	NODE
273.25	24.57	.280	.12	.034	1.32	215.48	4630.0
269.53	27.64	.281	.12	.034	1.23	230.87	4620.0
266.94	21.51	.280	.12	.033	1.41	193.49	4610.0
271.56	22.35	.280	.12	.033	1.39	200.06	4520.0
272.53	23.07	.280	.12	.033	1.37	205.72	4510.0
273.37	23.93	.280	.12	.033	1.34	211.61	4530.0
271.76	26.16	.281	.12	.034	1.28	224.45	4540.0
267.56	28.06	.281	.12	.034	1.22	231.63	4501.0

TOTAL AREA(ACRES)= 231.63

4602.00	MEMORY BANK # 1 COPIED ONTO MAIN-STREAM													

Q(cfs)	Tc(min)	Fp(avg)	Ap(avg)	Fm(avg)	I(in/hr)	Ae(acres)	NODE
273.25	24.57	.280	.12	.034	1.32	215.48	4630.0
269.53	27.64	.281	.12	.034	1.23	230.87	4620.0
266.94	21.51	.280	.12	.033	1.41	193.49	4610.0
271.56	22.35	.280	.12	.033	1.39	200.06	4520.0
272.53	23.07	.280	.12	.033	1.37	205.72	4510.0
273.37	23.93	.280	.12	.033	1.34	211.61	4530.0
271.76	26.16	.281	.12	.034	1.28	224.45	4540.0
267.56	28.06	.281	.12	.034	1.22	231.63	4501.0

TOTAL AREA(ACRES)= 231.63

											423	.0054	12.1	Qpipe= 273.4cfs n=.0130 D= 4.5
4701.00					.6									72.0"-PIPE
4701.00		211.6			24.5	1.30			273.4					FOR CONFLUENCE
					..						403	.0020	..	INITIAL SUBAREA
4711.00	5.2	5.2	C	Com	11.6	2.05	.03	.025	9.5					

1-1-72

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 47

[ORANGE COUNTY]

FILE NAME:SA47.DAT | CALCULATED BY:
TIME/DATE OF STUDY: 12:12 10/29/1993 | CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) | PAGE NUMBER 2 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
											512	.0020	1.6	Qest.= 14.6cfs
48.ft-STREET FLOW TO PT.#					5.5									D= .6 ,D*V= .9 FLOODWIDTH=23.7
4701.00	6.8	12.1	C	Com	----	17.1	1.66	.03	.025	17.8	----	-----	----	
CONFLUENCE ANALYSIS FOR POINT# 4701.00	PEAK FLOW RATE(CFS) = 287.5 TIME OF CONCENTRATION(MIN.) = 24.5 MEAN VALUES: Fp(IN/HR) = .279; Ap = .118; Fm(IN/HR) = .033 EFFECTIVE AREA(ACRES) = 223.67 TOTAL AREA(ACRES) = 243.69													LARGEST CONFLUENCE Q= 287.5

Q(cfs)	Tc(min)	Fp(avg)	Ap(avg)	Fm(avg)	I(in/hr)	Ae(acres)	NODE
281.84	22.10	.278	.12	.033	1.40	205.55	4610.0
286.19	22.93	.278	.12	.033	1.37	212.13	4520.0
286.92	23.65	.279	.12	.033	1.35	217.78	4510.0
287.48	24.52	.279	.12	.033	1.32	223.67	4530.0
287.15	25.15	.279	.12	.033	1.31	227.54	4630.0
285.14	26.74	.279	.12	.033	1.26	236.51	4540.0
282.43	28.23	.279	.12	.033	1.21	242.93	4620.0
280.32	28.65	.279	.12	.033	1.20	243.69	4501.0
264.62	17.11	.278	.12	.033	1.66	161.82	4710.0

											832	.0064	12.9	Qpipe= 287.5cfs
														n=.0130 D= 4.6
4702.00					1.1									69.0"-PIPE
4702.00		223.7			----	25.6	1.29			287.5	----	-----	----	FOR CONFLUENCE
					..						948	.0020	..	INITIAL SUBAREA
4716.00	7.9	7.9	C	Com	----	16.3	1.72	.03	.025	12.1	----	-----	----	
48.ft-STREET FLOW TO PT.#					3.0						452	.0050	2.5	Qest.= 24.0cfs D= .6 ,D*V= 1.4 FLOODWIDTH=24.4
4717.00	18.0	26.0	C	Com	----	19.4	1.50	.03	.025	34.6	----	-----	----	
											247	.0020	4.9	Qpipe= 34.6cfs
														n=.0130 D= 2.6
4702.00					.8									39.0"-PIPE

1-1-73

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 47

[ORANGE COUNTY]

FILE NAME:SA47.DAT — CALCULATED BY:
TIME/DATE OF STUDY: 12:12 10/29/1993 — CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) — PAGE NUMBER 3 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	AREA (ACRES) SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
CONFLUENCE ANALYSIS FOR POINT# 4702.00	PEAK FLOW RATE(CFS) = 318.2													
	TIME OF CONCENTRATION(MIN.) = 24.7													LARGEST CONFLUENCE Q= 318.2
	MEAN VALUES: Fp(IN/HR) = .276; Ap = .116; Fm(IN/HR) = .032													
	EFFECTIVE AREA(ACRES) = 243.76 TOTAL AREA(ACRES) = 269.67													
	Q(cfs)	Tc(min)	Fp(avg)	Ap(avg)	Fm(avg)	I(in/hr)	Ae(acres)	NODE						
	298.60	18.19	.275	.12	.032	1.59	185.19	4710.0						
	314.24	23.18	.275	.12	.032	1.36	231.53	4610.0						
	317.99	24.01	.276	.12	.032	1.34	238.11	4520.0						
	318.20	24.73	.276	.12	.032	1.32	243.76	4510.0						
	318.14	25.59	.276	.12	.032	1.29	249.66	4530.0						
	317.35	26.23	.276	.12	.032	1.27	253.52	4630.0						
	314.18	27.82	.277	.12	.032	1.23	262.49	4540.0						
	310.38	29.31	.277	.12	.033	1.18	268.91	4620.0						
	307.97	29.73	.277	.12	.033	1.17	269.67	4501.0						
	306.18	20.22	.275	.12	.032	1.45	205.60	4715.0						
									326	.0048	11.8	Qpipe= 318.2cfs		
4703.00					.5							n=.0130 D= 5.1 75.0"-PIPE		
4703.00	7.1	250.9	C	Com		25.2	1.30	.03	.032	318.2				ADD SUBAREA
											1031	.0050	12.1	Qpipe= 318.2cfs
4704.00					1.4							n=.0130 D= 5.0 75.0"-PIPE		
4704.00	12.1	263.0	C	Com		26.6	1.26	.03	.032	318.2				ADD SUBAREA
4704.00		263.0				26.6	1.26			318.2				FOR CONFLUENCE
					..						921	.0035	..	INITIAL SUBAREA
4721.00	7.7	7.7	C	Com		14.5	1.85	.03	.025	12.6				
											331	.0020	1.7	Qest.= 21.5cfs
48.ft-STREET FLOW TO PT.# 4722.00	12.4	20.1	C	Com	3.6	18.0	1.60	.03	.025	28.5				D= .6 ,D*V= 1.1 FLOODWIDTH=29.3

1-1-74

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 47

[ORANGE COUNTY]

FILE NAME:SA47.DAT | CALCULATED BY:
TIME/DATE OF STUDY: 12:12 10/29/1993 | CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) | PAGE NUMBER 4 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
											356	.0020	4.7	Qpipe= 28.5cfs
														n=.0130 D= 2.4
4704.00					1.3									36.0"-PIPE
CONFLUENCE ANALYSIS FOR POINT# 4704.00	PEAK FLOW RATE(CFS) = 342.1 TIME OF CONCENTRATION(MIN.) = 25.9 MEAN VALUES: Fp(IN/HR) = .273; Ap = .114; Fm(IN/HR) = .031 EFFECTIVE AREA(ACRES) = 277.45 TOTAL AREA(ACRES) = 309.01													LARGEST CONFLUENCE Q= 342.1

Q(cfs)	Tc(min)	Fp(avg)	Ap(avg)	Fm(avg)	I(in/hr)	Ae(acres)	NODE
326.06	20.08	.271	.11	.031	1.46	224.53	4710.0
332.47	22.11	.271	.11	.031	1.40	244.94	4715.0
338.83	25.06	.272	.11	.031	1.31	270.87	4610.0
342.11	25.89	.273	.11	.031	1.28	277.45	4520.0
341.90	26.61	.273	.11	.031	1.26	283.10	4510.0
341.34	27.47	.273	.11	.031	1.24	288.99	4530.0
340.18	28.11	.273	.11	.031	1.22	292.86	4630.0
336.11	29.70	.274	.11	.031	1.17	301.83	4540.0
331.75	31.19	.274	.12	.032	1.14	308.25	4620.0
329.20	31.62	.274	.12	.032	1.13	309.01	4501.0
325.77	19.29	.271	.11	.031	1.51	216.43	4720.0

											1316	.0060	13.2	Qpipe= 342.1cfs
														n=.0130 D= 4.9
4705.00					1.7									75.0"-PIPE
4705.00	9.5	287.0	C	Com	----	27.5	1.23	.03	.031	342.1	----	-----	----	ADD SUBAREA
											1013	.0036	11.0	Qpipe= 342.1cfs
														n=.0130 D= 5.3
4706.00					1.5									84.0"-PIPE
4706.00	5.9	292.9	C	Com	----	29.1	1.19	.03	.031	342.1	----	-----	----	ADD SUBAREA
											158	.0010	6.8	Qpipe= 342.1cfs
														n=.0130 D= 6.6
4707.00					.4									108.0"-PIPE
4707.00	16.1	309.0	C	Com	----	29.5	1.18	.03	.030	342.1	----	-----	----	ADD SUBAREA

1-1-75

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 47

[ORANGE COUNTY]

FILE NAME:SA47.DAT | CALCULATED BY:
TIME/DATE OF STUDY: 12:12 10/29/1993 | CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) | PAGE NUMBER 5 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
4707.00	MAIN-STREAM COPIED ONTO MEMORY BANK # 2													
					..						955	.0020	..	INITIAL SUBAREA
4731.00	6.5	6.5	C	Com	16.4	1.71	.03	.025	9.8					
											913	.0050	2.7	Qest.= 13.6cfs
64.ft-STREET FLOW TO PT.#					5.9									D= .6 ,D*V= 1.6 FLOODWIDTH=22.5
4732.00	6.2	12.7	C	Com	22.3	1.39	.03	.025	15.6					
											347	.0050	5.7	Qpipe= 15.6cfs
														n=.0130 D= 1.6
4733.00					1.0									24.0"-PIPE
4733.00	21.6	34.3	C	Com	23.3	1.36	.03	.025	41.3					ADD SUBAREA
											697	.0010	4.0	Qpipe= 41.3cfs
														n=.0130 D= 3.1
4736.00					2.9									48.0"-PIPE
4736.00		34.3			26.2	1.27			41.3					FOR CONFLUENCE
					..						545	.0020	..	INITIAL SUBAREA
4735.00	9.0	9.0	C	Com	13.1	1.94	.03	.025	15.6					
											624	.0024	4.4	Qpipe= 15.6cfs
														n=.0130 D= 1.7
4736.00					2.4									30.0"-PIPE
4736.00	10.0	19.0	C	Com	15.4	1.78	.03	.025	30.0					ADD SUBAREA

CONFLUENCE ANALYSIS FOR POINT# 4736.00

PEAK FLOW RATE(CFS) = 64.1
TIME OF CONCENTRATION(MIN.) = 15.4
MEAN VALUES: Fp(IN/HR) = .250; Ap = .100; Fm(IN/HR) = .025
EFFECTIVE AREA(ACRES) = 39.24 TOTAL AREA(ACRES) = 53.29

LARGEST CONFLUENCE Q= 64.1

Q(cfs)	Tc(min)	Fp(avg)	Ap(avg)	Fm(avg)	I(in/hr)	Ae(acres)	NODE
62.62	26.18	.250	.10	.025	1.27	53.29	4730.0
64.15	15.45	.250	.10	.025	1.78	39.24	4734.0

1-1-76

DESCRIPTION OF STUDY:
CITY OF SANTA ANA MASTER PLAN OF DRAINAGE
10-YEAR RETURN FREQUENCY AT 50% CONFIDENCE LEVEL
MAP # 47

[ORANGE COUNTY]

FILE NAME:SA47.DAT — CALCULATED BY:
TIME/DATE OF STUDY: 12:12 10/29/1993 — CHECKED BY:
5.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) — PAGE NUMBER 6 OF

[(c) 1983-1991 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I in/h	Fm	Fm (Avg)	Q SUM	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
											963	.0050	8.2	Qpipe= 64.1cfs
														n=.0130 D= 2.7
4737.00					2.0									42.0"-PIPE
4737.00	17.1	56.3	C	Com	----	17.4	1.64	.03	.025	81.9	----	-----	----	ADD SUBAREA
											278	.0076	10.1	Qpipe= 81.9cfs
														n=.0130 D= 2.7
4738.00					.5									42.0"-PIPE
4738.00	16.7	73.1	C	Com	----	17.9	1.61	.03	.025	104.2	----	-----	----	ADD SUBAREA
											657	.0050	9.3	Qpipe= 104.2cfs
														n=.0130 D= 3.1
4739.00					1.2									51.0"-PIPE
4739.00	9.3	82.4	C	Com	----	19.1	1.53	.03	.025	111.3	----	-----	----	ADD SUBAREA
											664	.0020	6.6	Qpipe= 111.3cfs
														n=.0130 D= 4.0
4707.00					1.7									60.0"-PIPE

4707.00 MEMORY BANK # 2 CONFLUENCED WITH MAIN-STREAM

Q(cfs)	Tc(min)	Fp(avg)	Ap(avg)	Fm(avg)	I(in/hr)	Ae(acres)	NODE
420.43	20.73	.264	.11	.029	1.44	306.78	4734.0
439.34	31.57	.267	.11	.029	1.13	420.17	4730.0
434.60	22.91	.264	.11	.029	1.37	333.23	4720.0
433.97	23.71	.264	.11	.029	1.35	342.35	4710.0
438.09	25.72	.265	.11	.029	1.29	365.37	4715.0
441.09	28.67	.266	.11	.029	1.20	395.13	4610.0
443.45	29.47	.266	.11	.029	1.18	402.74	4520.0
442.43	30.19	.266	.11	.029	1.16	409.33	4510.0
440.88	31.05	.267	.11	.029	1.14	416.34	4530.0
438.95	31.69	.267	.11	.029	1.13	420.88	4630.0
432.42	33.31	.267	.11	.030	1.10	429.85	4540.0
425.78	34.81	.268	.11	.030	1.08	436.27	4620.0
422.57	35.24	.268	.11	.030	1.07	437.04	4501.0

TOTAL AREA(ACRES)= 437.04

1-1-77

APPENDIX J: PROPOSED HYDROLOGY – RATIONAL METHOD

(AES OUTPUT)

```
**************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2008 Advanced Engineering Software (aes)
             Ver. 15.0  Release Date: 04/01/2008  License ID 1619

                          Analysis prepared by:

                                IBI Group
                          10 Exchange Place, Suite 112
                            Salt Lake City, UT 84111
                                (801) 532-4233

--------------------------------------------------------------------------
  FILE NAME: HYDRO_TY.DAT
  TIME/DATE OF STUDY: 10:42 06/05/2009
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *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
  2   43.0     38.0    0.020/0.020/0.020   0.67    2.00 0.0312 0.167 0.0150
  3   40.0     35.0    0.020/0.020/0.020   0.67    2.00 0.0312 0.167 0.0150
  4   35.0     30.0    0.020/0.020/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth = -0.10 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.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE   3826.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   803.00
  ELEVATION DATA: UPSTREAM(FEET) =     63.00  DOWNSTREAM(FEET) =     59.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.410
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.307
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C       10.20      0.25      0.100    69   13.41
  RESIDENTIAL
```

```
  "5-7 DWELLINGS/ACRE"       C        2.60      0.25     0.500    69   17.16
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.181
  SUBAREA RUNOFF(CFS) =     26.05
  TOTAL AREA(ACRES) =     12.80   PEAK FLOW RATE(CFS) =     26.05

****************************************************************************
  FLOW PROCESS FROM NODE   3826.00 TO NODE   3826.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   13.41
  RAINFALL INTENSITY(INCH/HR) =   2.31
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.18
  EFFECTIVE STREAM AREA(ACRES) =      12.80
  TOTAL STREAM AREA(ACRES) =      12.80
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      26.05

****************************************************************************
  FLOW PROCESS FROM NODE   3825.00 TO NODE   3826.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN.) =   29.10   RAINFALL INTENSITY(INCH/HR) =  1.48
  EFFECTIVE AREA(ACRES) =    59.90
  TOTAL AREA(ACRES) =    59.90        PEAK FLOW RATE(CFS) =    112.20
  AREA-AVERAGED Fm(INCH/HR) =   0.04  AREA-AVERAGED Fp(INCH/HR) =   0.25
  AREA-AVERAGED Ap =  0.16
  NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
        CONFLUENCE ANALYSES.

****************************************************************************
  FLOW PROCESS FROM NODE   3826.00 TO NODE   3826.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   29.10
  RAINFALL INTENSITY(INCH/HR) =   1.48
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.16
  EFFECTIVE STREAM AREA(ACRES) =      59.90
  TOTAL STREAM AREA(ACRES) =      59.90
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     112.20

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       26.05   13.41    2.307  0.25( 0.05) 0.18      12.8       0.00
      2      112.20   29.10    1.480  0.25( 0.04) 0.16      59.9    3825.00

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

  ** PEAK FLOW RATE TABLE **
```

```
 STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
    1      107.45   13.41    2.307  0.25( 0.04) 0.17      40.4       0.00
    2      128.72   29.10    1.480  0.25( 0.04) 0.16      72.7    3825.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     128.72    Tc(MIN.) =    29.10
  EFFECTIVE AREA(ACRES) =      72.70   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.16
  TOTAL AREA(ACRES) =       72.7
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   3826.00 =     803.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3826.00 TO NODE   3834.00 IS CODE =  43
----------------------------------------------------------------------------
  >>>>>COMPUTE COUPLED PIPEFLOW/STREETFLOW THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE(EXISTING) (PRESSURE FLOW)<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    50.30
  DOWNSTREAM NODE ELEVATION(FEET) =    49.45
  FLOW LENGTH(FEET) =   355.00   MANNING'S N =  0.013

  USER SPECIFIED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.71
  PIPE-FLOW(CFS) =      14.77
  PIPEFLOW TRAVEL TIME(MIN.) =   1.59    Tc(MIN.) =  30.69
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.435
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C       10.30      0.25     0.500    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  SUBAREA AREA(ACRES) =   10.30      SUBAREA RUNOFF(CFS) =   12.15
  EFFECTIVE AREA(ACRES) =     83.00    AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.21
  TOTAL AREA(ACRES) =       83.0        PEAK FLOW RATE(CFS) =     128.72
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

  STREET CROSS-SECTION INFORMATION:
  CURB HEIGHT(INCHES) =  8.0       STREET HALFWIDTH(FEET) = 43.00
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  38.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020
  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  MAXIMUM ALLOWABLE STREET FLOW DEPTH(FEET) =   0.57
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0300
  *NOTE: STREET-CAPACITY MAY BE EXCEEDED*
  STREETFLOW HYDRAULICS BASED ON MAINLINE Tc :
  STREET HYDRAULICS COMPUTED USING ESTIMATED FLOW(CFS) =  113.96
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  1.03
    HALFSTREET FLOOD WIDTH(FEET) =   61.34
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.51
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    2.59
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L =   355.0 FT WITH ELEVATION-DROP =   0.8 FT, IS   20.0 CFS,
         WHICH EXCEEDS THE SPECIFIED STREET CAPACITY AT NODE   3834.00
```

```
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   3834.00 =    1158.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3834.00 TO NODE   3834.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   30.69
  RAINFALL INTENSITY(INCH/HR) =   1.44
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.21
  EFFECTIVE STREAM AREA(ACRES) =      83.00
  TOTAL STREAM AREA(ACRES) =      83.00
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     128.72

****************************************************************************
  FLOW PROCESS FROM NODE   3833.00 TO NODE   3834.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN.) =   26.90   RAINFALL INTENSITY(INCH/HR) =  1.55
  EFFECTIVE AREA(ACRES) =    18.40
  TOTAL AREA(ACRES) =    18.40        PEAK FLOW RATE(CFS) =     18.60
  AREA-AVERAGED Fm(INCH/HR) =   0.12  AREA-AVERAGED Fp(INCH/HR) =   0.25
  AREA-AVERAGED Ap =  0.50
  NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
        CONFLUENCE ANALYSES.

****************************************************************************
  FLOW PROCESS FROM NODE   3834.00 TO NODE   3834.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   26.90
  RAINFALL INTENSITY(INCH/HR) =   1.55
  AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.50
  EFFECTIVE STREAM AREA(ACRES) =      18.40
  TOTAL STREAM AREA(ACRES) =      18.40
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      18.60

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1      107.45   15.00    2.163  0.25( 0.06) 0.23      50.7       0.00
      1      128.72   30.69    1.435  0.25( 0.05) 0.21      83.0    3825.00
      2       18.60   26.90    1.548  0.25( 0.12) 0.50      18.4    3833.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1      122.31   15.00    2.163  0.25( 0.07) 0.28      61.0       0.00
```

```
     2      142.18   26.90    1.548  0.25( 0.07) 0.27      93.6    3833.00
     3      145.85   30.69    1.435  0.25( 0.06) 0.26     101.4    3825.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     145.85    Tc(MIN.) =    30.69
  EFFECTIVE AREA(ACRES) =     101.40   AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.26
  TOTAL AREA(ACRES) =      101.4
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   3834.00 =    1158.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3834.00 TO NODE   3845.00 IS CODE =  43
----------------------------------------------------------------------------
  >>>>>COMPUTE COUPLED PIPEFLOW/STREETFLOW THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE(EXISTING) (PRESSURE FLOW)<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    49.45
  DOWNSTREAM NODE ELEVATION(FEET) =    47.94
  FLOW LENGTH(FEET) =   646.00   MANNING'S N =  0.013

  USER SPECIFIED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.67
  PIPE-FLOW(CFS) =      14.59
  *NOTE: USER SPECIFIED PIPE SYSTEM CAN NOT CARRY TOTAL UPSTREAM PIPEFLOW*
  PIPEFLOW TRAVEL TIME(MIN.) =   2.94    Tc(MIN.) =  33.63
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.362
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C       19.30      0.25     0.500    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  SUBAREA AREA(ACRES) =   19.30      SUBAREA RUNOFF(CFS) =   21.49
  EFFECTIVE AREA(ACRES) =    120.70    AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.30
  TOTAL AREA(ACRES) =      120.7        PEAK FLOW RATE(CFS) =     145.85
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

  STREET CROSS-SECTION INFORMATION:
  CURB HEIGHT(INCHES) =  8.0       STREET HALFWIDTH(FEET) = 43.00
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  38.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020
  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  MAXIMUM ALLOWABLE STREET FLOW DEPTH(FEET) =   0.57
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0300
  *NOTE: STREET-CAPACITY MAY BE EXCEEDED*
  STREETFLOW HYDRAULICS BASED ON MAINLINE Tc :
  STREET HYDRAULICS COMPUTED USING ESTIMATED FLOW(CFS) =  131.26
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  1.08
    HALFSTREET FLOOD WIDTH(FEET) =   63.42
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.60
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    2.79
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L =   646.0 FT WITH ELEVATION-DROP =   1.5 FT, IS   32.4 CFS,
         WHICH EXCEEDS THE SPECIFIED STREET CAPACITY AT NODE   3845.00
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   3845.00 =    1804.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE   3845.00 TO NODE   3845.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   33.63
  RAINFALL INTENSITY(INCH/HR) =   1.36
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.30
  EFFECTIVE STREAM AREA(ACRES) =     120.70
  TOTAL STREAM AREA(ACRES) =     120.70
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     145.85

****************************************************************************
  FLOW PROCESS FROM NODE   3844.00 TO NODE   3845.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN.) =   27.40   RAINFALL INTENSITY(INCH/HR) =  1.53
  EFFECTIVE AREA(ACRES) =    30.70
  TOTAL AREA(ACRES) =    30.70        PEAK FLOW RATE(CFS) =     30.80
  AREA-AVERAGED Fm(INCH/HR) =   0.12  AREA-AVERAGED Fp(INCH/HR) =   0.25
  AREA-AVERAGED Ap =  0.50
  NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
        CONFLUENCE ANALYSES.

****************************************************************************
  FLOW PROCESS FROM NODE   3845.00 TO NODE   3845.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   27.40
  RAINFALL INTENSITY(INCH/HR) =   1.53
  AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.50
  EFFECTIVE STREAM AREA(ACRES) =      30.70
  TOTAL STREAM AREA(ACRES) =      30.70
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      30.80

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1      135.03   17.94    1.952  0.25( 0.08) 0.33      80.3       0.00
      1      142.18   29.84    1.459  0.25( 0.08) 0.31     112.9    3833.00
      1      145.85   33.63    1.362  0.25( 0.07) 0.30     120.7    3825.00
      2       30.80   27.40    1.532  0.25( 0.12) 0.50      30.7    3844.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1      161.23   17.94    1.952  0.25( 0.09) 0.37     100.4       0.00
```

```
     2      171.52   27.40    1.532  0.25( 0.09) 0.36     136.9    3844.00
     3      171.38   29.84    1.459  0.25( 0.09) 0.35     143.6    3833.00
     4      172.94   33.63    1.362  0.25( 0.08) 0.34     151.4    3825.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     172.94    Tc(MIN.) =    33.63
  EFFECTIVE AREA(ACRES) =     151.40   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.34
  TOTAL AREA(ACRES) =      151.4
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   3845.00 =    1804.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3845.00 TO NODE   3805.00 IS CODE =  43
----------------------------------------------------------------------------
  >>>>>COMPUTE COUPLED PIPEFLOW/STREETFLOW THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE(EXISTING) (PRESSURE FLOW)<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    47.91
  DOWNSTREAM NODE ELEVATION(FEET) =    44.72
  FLOW LENGTH(FEET) =  1110.00   MANNING'S N =  0.013

  USER SPECIFIED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.07
  PIPE-FLOW(CFS) =      16.18
  PIPEFLOW TRAVEL TIME(MIN.) =   4.55    Tc(MIN.) =  38.18
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.266
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C       23.90      0.25     0.500    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
  SUBAREA AREA(ACRES) =   23.90      SUBAREA RUNOFF(CFS) =   24.55
  EFFECTIVE AREA(ACRES) =    175.30    AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.36
  TOTAL AREA(ACRES) =      175.3        PEAK FLOW RATE(CFS) =     185.59

  STREET CROSS-SECTION INFORMATION:
  CURB HEIGHT(INCHES) =  8.0       STREET HALFWIDTH(FEET) = 43.00
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  38.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020
  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  MAXIMUM ALLOWABLE STREET FLOW DEPTH(FEET) =   0.57
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0300
  *NOTE: STREET-CAPACITY MAY BE EXCEEDED*
  STREETFLOW HYDRAULICS BASED ON MAINLINE Tc :
  STREET HYDRAULICS COMPUTED USING ESTIMATED FLOW(CFS) =  169.41
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  1.12
    HALFSTREET FLOOD WIDTH(FEET) =   65.61
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.01
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    3.37
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L =  1110.0 FT WITH ELEVATION-DROP =   3.2 FT, IS   36.0 CFS,
         WHICH EXCEEDS THE SPECIFIED STREET CAPACITY AT NODE   3805.00

  ** PEAK FLOW RATE TABLE **
```

```
 STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
    1      180.87   22.49    1.715  0.25( 0.10) 0.39     124.3       0.00
    2      189.36   31.95    1.403  0.25( 0.09) 0.38     160.8    3844.00
    3      188.73   34.39    1.345  0.25( 0.09) 0.37     167.5    3833.00
    4      185.59   38.18    1.266  0.25( 0.09) 0.36     175.3    3825.00
  NEW PEAK FLOW DATA ARE:
  PEAK FLOW RATE(CFS) =     189.36  Tc(MIN.) =   31.95
  AREA-AVERAGED Fm(INCH/HR) =  0.09  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.38  EFFECTIVE AREA(ACRES) =     160.81
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   3805.00 =    2914.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3805.00 TO NODE   3805.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   31.95
  RAINFALL INTENSITY(INCH/HR) =   1.40
  AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.39
  EFFECTIVE STREAM AREA(ACRES) =     160.81
  TOTAL STREAM AREA(ACRES) =     175.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     189.36

****************************************************************************
  FLOW PROCESS FROM NODE   3804.00 TO NODE   3805.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN.) =   52.30   RAINFALL INTENSITY(INCH/HR) =  1.06
  EFFECTIVE AREA(ACRES) =  1138.80
  TOTAL AREA(ACRES) =  1138.80        PEAK FLOW RATE(CFS) =    830.30
  AREA-AVERAGED Fm(INCH/HR) =   0.12  AREA-AVERAGED Fp(INCH/HR) =   0.25
  AREA-AVERAGED Ap =  0.50
  NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
        CONFLUENCE ANALYSES.

****************************************************************************
  FLOW PROCESS FROM NODE   3805.00 TO NODE   3805.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   52.30
  RAINFALL INTENSITY(INCH/HR) =   1.06
  AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.50
  EFFECTIVE STREAM AREA(ACRES) =    1138.80
  TOTAL STREAM AREA(ACRES) =    1138.80
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     830.30

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1      180.87   22.49    1.715  0.25( 0.10) 0.39     124.3       0.00
```

```
     1      189.36   31.95    1.403  0.25( 0.09) 0.38     160.8    3844.00
     1      188.73   34.39    1.345  0.25( 0.09) 0.37     167.5    3833.00
     1      185.59   38.18    1.266  0.25( 0.09) 0.36     175.3    3825.00
     2      830.30   52.30    1.058  0.25( 0.12) 0.50    1138.8    3804.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1      789.71   22.49    1.715  0.25( 0.12) 0.48     614.0       0.00
     2      884.28   31.95    1.403  0.25( 0.12) 0.48     856.5    3844.00
     3      902.78   34.39    1.345  0.25( 0.12) 0.48     916.2    3833.00
     4      927.55   38.18    1.266  0.25( 0.12) 0.48    1006.7    3825.00
     5      982.92   52.30    1.058  0.25( 0.12) 0.48    1314.1    3804.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     982.92    Tc(MIN.) =    52.30
  EFFECTIVE AREA(ACRES) =    1314.10   AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.48
  TOTAL AREA(ACRES) =     1314.1
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   3805.00 =    2914.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3805.00 TO NODE   3733.00 IS CODE =  43
----------------------------------------------------------------------------
  >>>>>COMPUTE COUPLED PIPEFLOW/STREETFLOW THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE(EXISTING) (PRESSURE FLOW)<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    44.57
  DOWNSTREAM NODE ELEVATION(FEET) =    43.53
  FLOW LENGTH(FEET) =   248.00   MANNING'S N =  0.013

  USER SPECIFIED PIPE DIAMETER(INCH) =  60.00    NUMBER OF PIPES =   1
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.37
  PIPE-FLOW(CFS) =     164.41
  PIPEFLOW TRAVEL TIME(MIN.) =   0.49    Tc(MIN.) =  52.79
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.052
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C       10.80      0.25     0.500    69
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        0.10      0.25     0.600    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.501
  SUBAREA AREA(ACRES) =   10.90      SUBAREA RUNOFF(CFS) =    9.09
  EFFECTIVE AREA(ACRES) =   1325.00    AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.48
  TOTAL AREA(ACRES) =     1325.0        PEAK FLOW RATE(CFS) =    1110.73

  STREET CROSS-SECTION INFORMATION:
  CURB HEIGHT(INCHES) =  8.0       STREET HALFWIDTH(FEET) = 43.00
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  38.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020
  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  MAXIMUM ALLOWABLE STREET FLOW DEPTH(FEET) =   0.57
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
```

```
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0300
  *NOTE: STREET-CAPACITY MAY BE EXCEEDED*
  STREETFLOW HYDRAULICS BASED ON MAINLINE Tc :
  STREET HYDRAULICS COMPUTED USING ESTIMATED FLOW(CFS) =  946.32
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  1.84
    HALFSTREET FLOOD WIDTH(FEET) =  101.44
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.38
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    9.87
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L =   248.0 FT WITH ELEVATION-DROP =   1.0 FT, IS   24.7 CFS,
         WHICH EXCEEDS THE SPECIFIED STREET CAPACITY AT NODE   3733.00

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1      885.35   22.98    1.694  0.25( 0.12) 0.48     624.9       0.00
      2      992.21   32.44    1.390  0.25( 0.12) 0.48     867.4    3844.00
      3     1013.49   34.88    1.334  0.25( 0.12) 0.48     927.1    3833.00
      4     1042.33   38.67    1.257  0.25( 0.12) 0.48    1017.6    3825.00
      5     1110.73   52.79    1.052  0.25( 0.12) 0.48    1325.0    3804.00
  NEW PEAK FLOW DATA ARE:
  PEAK FLOW RATE(CFS) =    1110.73  Tc(MIN.) =   52.79
  AREA-AVERAGED Fm(INCH/HR) =  0.12  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.48  EFFECTIVE AREA(ACRES) =    1325.00
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   3733.00 =    3162.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3733.00 TO NODE   3733.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   52.79
  RAINFALL INTENSITY(INCH/HR) =   1.05
  AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.48
  EFFECTIVE STREAM AREA(ACRES) =    1325.00
  TOTAL STREAM AREA(ACRES) =    1325.00
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    1110.73

****************************************************************************
  FLOW PROCESS FROM NODE   3732.00 TO NODE   3733.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN.) =   21.20   RAINFALL INTENSITY(INCH/HR) =  1.77
  EFFECTIVE AREA(ACRES) =     8.00
  TOTAL AREA(ACRES) =     8.00        PEAK FLOW RATE(CFS) =     22.00
  AREA-AVERAGED Fm(INCH/HR) =   0.13  AREA-AVERAGED Fp(INCH/HR) =   0.25
  AREA-AVERAGED Ap =  0.52
  NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
         CONFLUENCE ANALYSES.

****************************************************************************
  FLOW PROCESS FROM NODE   3733.00 TO NODE   3733.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
```

```
==============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   21.20
  RAINFALL INTENSITY(INCH/HR) =   1.77
  AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.52
  EFFECTIVE STREAM AREA(ACRES) =       8.00
  TOTAL STREAM AREA(ACRES) =       8.00
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      22.00

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1      885.35   22.98    1.694  0.25( 0.12) 0.48     624.9       0.00
      1      992.21   32.44    1.390  0.25( 0.12) 0.48     867.4    3844.00
      1     1013.49   34.88    1.334  0.25( 0.12) 0.48     927.1    3833.00
      1     1042.33   38.67    1.257  0.25( 0.12) 0.48    1017.6    3825.00
      1     1110.73   52.79    1.052  0.25( 0.12) 0.48    1325.0    3804.00
      2       22.00   21.20    1.774  0.25( 0.13) 0.52       8.0    3732.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1      880.26   21.20    1.774  0.25( 0.12) 0.48     584.4    3732.00
      2      906.28   22.98    1.694  0.25( 0.12) 0.48     632.9       0.00
      3     1009.08   32.44    1.390  0.25( 0.12) 0.48     875.4    3844.00
      4     1029.60   34.88    1.334  0.25( 0.12) 0.48     935.1    3833.00
      5     1057.41   38.67    1.257  0.25( 0.12) 0.48    1025.6    3825.00
      6     1123.07   52.79    1.052  0.25( 0.12) 0.48    1333.0    3804.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =    1123.07    Tc(MIN.) =    52.79
  EFFECTIVE AREA(ACRES) =    1333.00   AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.48
  TOTAL AREA(ACRES) =     1333.0
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   3733.00 =    3162.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3733.00 TO NODE   3739.00 IS CODE =  43
----------------------------------------------------------------------------
  >>>>>COMPUTE COUPLED PIPEFLOW/STREETFLOW THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE(EXISTING) (PRESSURE FLOW)<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    43.53
  DOWNSTREAM NODE ELEVATION(FEET) =    42.23
  FLOW LENGTH(FEET) =   278.00   MANNING'S N =  0.013

  USER SPECIFIED PIPE DIAMETER(INCH) =  60.00    NUMBER OF PIPES =   1
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.83
  PIPE-FLOW(CFS) =     173.61
  PIPEFLOW TRAVEL TIME(MIN.) =   0.52    Tc(MIN.) =  53.32
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.046
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C       11.20      0.25     0.500    69
```

```
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        0.10      0.25     0.600    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.501
  SUBAREA AREA(ACRES) =   11.30      SUBAREA RUNOFF(CFS) =    9.36
  EFFECTIVE AREA(ACRES) =   1344.30    AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.48
  TOTAL AREA(ACRES) =     1344.3        PEAK FLOW RATE(CFS) =    1123.07
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

  STREET CROSS-SECTION INFORMATION:
  CURB HEIGHT(INCHES) =  8.0       STREET HALFWIDTH(FEET) = 43.00
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  38.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020
  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  MAXIMUM ALLOWABLE STREET FLOW DEPTH(FEET) =   0.57
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0300
  *NOTE: STREET-CAPACITY MAY BE EXCEEDED*
  STREETFLOW HYDRAULICS BASED ON MAINLINE Tc :
  STREET HYDRAULICS COMPUTED USING ESTIMATED FLOW(CFS) =  949.45
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  1.80
    HALFSTREET FLOOD WIDTH(FEET) =   99.79
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.61
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =   10.11
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L =   278.0 FT WITH ELEVATION-DROP =   1.3 FT, IS   25.3 CFS,
         WHICH EXCEEDS THE SPECIFIED STREET CAPACITY AT NODE   3739.00
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   3739.00 =    3440.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3739.00 TO NODE   3739.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   53.32
  RAINFALL INTENSITY(INCH/HR) =   1.05
  AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.48
  EFFECTIVE STREAM AREA(ACRES) =    1344.30
  TOTAL STREAM AREA(ACRES) =    1344.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    1123.07

****************************************************************************
  FLOW PROCESS FROM NODE   3738.00 TO NODE   3739.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN.) =   26.90   RAINFALL INTENSITY(INCH/HR) =  1.55
  EFFECTIVE AREA(ACRES) =    36.10
  TOTAL AREA(ACRES) =    36.10        PEAK FLOW RATE(CFS) =     36.60
  AREA-AVERAGED Fm(INCH/HR) =   0.12  AREA-AVERAGED Fp(INCH/HR) =   0.25
  AREA-AVERAGED Ap =  0.50
  NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
         CONFLUENCE ANALYSES.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE   3739.00 TO NODE   3739.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   26.90
  RAINFALL INTENSITY(INCH/HR) =   1.55
  AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.50
  EFFECTIVE STREAM AREA(ACRES) =      36.10
  TOTAL STREAM AREA(ACRES) =      36.10
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      36.60

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1      880.26   21.72    1.749  0.25( 0.12) 0.48     595.7    3732.00
      1      906.28   23.51    1.672  0.25( 0.12) 0.48     644.2       0.00
      1     1009.08   32.97    1.378  0.25( 0.12) 0.48     886.7    3844.00
      1     1029.60   35.40    1.322  0.25( 0.12) 0.48     946.4    3833.00
      1     1057.41   39.20    1.247  0.25( 0.12) 0.48    1036.9    3825.00
      1     1123.07   53.32    1.046  0.25( 0.12) 0.48    1344.3    3804.00
      2       36.60   26.90    1.548  0.25( 0.12) 0.50      36.1    3738.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1      914.01   21.72    1.749  0.25( 0.12) 0.48     624.8    3732.00
      2      941.06   23.51    1.672  0.25( 0.12) 0.48     675.7       0.00
      3      979.73   26.90    1.548  0.25( 0.12) 0.48     767.2    3738.00
      4     1041.30   32.97    1.378  0.25( 0.12) 0.48     922.8    3844.00
      5     1060.40   35.40    1.322  0.25( 0.12) 0.48     982.5    3833.00
      6     1086.28   39.20    1.247  0.25( 0.12) 0.48    1073.0    3825.00
      7     1146.75   53.32    1.046  0.25( 0.12) 0.48    1380.4    3804.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =    1146.75    Tc(MIN.) =    53.32
  EFFECTIVE AREA(ACRES) =    1380.40   AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.48
  TOTAL AREA(ACRES) =     1380.4
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   3739.00 =    3440.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3739.00 TO NODE   3745.00 IS CODE =  43
----------------------------------------------------------------------------
  >>>>>COMPUTE COUPLED PIPEFLOW/STREETFLOW THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE(EXISTING) (PRESSURE FLOW)<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    42.23
  DOWNSTREAM NODE ELEVATION(FEET) =    40.67
  FLOW LENGTH(FEET) =   377.00   MANNING'S N =  0.013

  USER SPECIFIED PIPE DIAMETER(INCH) =  60.00    NUMBER OF PIPES =   1
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.31
```

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 PIPE-FLOW(CFS) =     163.32
 *NOTE: USER SPECIFIED PIPE SYSTEM CAN NOT CARRY TOTAL UPSTREAM PIPEFLOW*
 PIPEFLOW TRAVEL TIME(MIN.) =   0.76    Tc(MIN.) =  54.07
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.037
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 C        0.10      0.25     0.100    69
 APARTMENTS                 C       12.40      0.25     0.200    69
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE"       C        0.20      0.25     0.500    69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.204
 SUBAREA AREA(ACRES) =   12.70      SUBAREA RUNOFF(CFS) =   11.28
 EFFECTIVE AREA(ACRES) =   1393.10    AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.48
 TOTAL AREA(ACRES) =     1393.1        PEAK FLOW RATE(CFS) =    1150.36

 STREET CROSS-SECTION INFORMATION:
 CURB HEIGHT(INCHES) =  8.0       STREET HALFWIDTH(FEET) = 43.00
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  38.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020
 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 MAXIMUM ALLOWABLE STREET FLOW DEPTH(FEET) =   0.57
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0300
 *NOTE: STREET-CAPACITY MAY BE EXCEEDED*
 STREETFLOW HYDRAULICS BASED ON MAINLINE Tc :
 STREET HYDRAULICS COMPUTED USING ESTIMATED FLOW(CFS) =  987.04
   ***STREET FLOWING FULL***
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  1.87
   HALFSTREET FLOOD WIDTH(FEET) =  103.15
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.40
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =   10.09
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
        AND L =   377.0 FT WITH ELEVATION-DROP =   1.6 FT, IS   31.0 CFS,
        WHICH EXCEEDS THE SPECIFIED STREET CAPACITY AT NODE   3745.00

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1      916.20   22.48    1.716  0.25( 0.12) 0.47     637.5    3732.00
     2      943.79   24.27    1.642  0.25( 0.12) 0.48     688.4       0.00
     3      985.96   27.66    1.523  0.25( 0.12) 0.48     779.9    3738.00
     4     1044.89   33.72    1.360  0.25( 0.12) 0.47     935.5    3844.00
     5     1063.95   36.16    1.307  0.25( 0.12) 0.47     995.2    3833.00
     6     1089.81   39.96    1.234  0.25( 0.12) 0.47    1085.7    3825.00
     7     1150.36   54.07    1.037  0.25( 0.12) 0.48    1393.1    3804.00
 NEW PEAK FLOW DATA ARE:
 PEAK FLOW RATE(CFS) =    1150.36  Tc(MIN.) =   54.07
 AREA-AVERAGED Fm(INCH/HR) =  0.12  AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.48  EFFECTIVE AREA(ACRES) =    1393.10
 LONGEST FLOWPATH FROM NODE      0.00 TO NODE   3745.00 =    3817.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE   3745.00 TO NODE   3745.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
```

```
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   54.07
  RAINFALL INTENSITY(INCH/HR) =   1.04
  AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.48
  EFFECTIVE STREAM AREA(ACRES) =    1393.10
  TOTAL STREAM AREA(ACRES) =    1393.10
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    1150.36

****************************************************************************
  FLOW PROCESS FROM NODE   3744.00 TO NODE   3745.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN.) =   22.00   RAINFALL INTENSITY(INCH/HR) =  1.74
  EFFECTIVE AREA(ACRES) =    25.00
  TOTAL AREA(ACRES) =    25.00        PEAK FLOW RATE(CFS) =     30.00
  AREA-AVERAGED Fm(INCH/HR) =   0.07  AREA-AVERAGED Fp(INCH/HR) =   0.25
  AREA-AVERAGED Ap =  0.27
  NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
        CONFLUENCE ANALYSES.

****************************************************************************
  FLOW PROCESS FROM NODE   3745.00 TO NODE   3745.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   22.00
  RAINFALL INTENSITY(INCH/HR) =   1.74
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.27
  EFFECTIVE STREAM AREA(ACRES) =      25.00
  TOTAL STREAM AREA(ACRES) =      25.00
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      30.00

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1      916.20   22.48    1.716  0.25( 0.12) 0.47     637.5    3732.00
      1      943.79   24.27    1.642  0.25( 0.12) 0.48     688.4       0.00
      1      985.96   27.66    1.523  0.25( 0.12) 0.48     779.9    3738.00
      1     1044.89   33.72    1.360  0.25( 0.12) 0.47     935.5    3844.00
      1     1063.95   36.16    1.307  0.25( 0.12) 0.47     995.2    3833.00
      1     1089.81   39.96    1.234  0.25( 0.12) 0.47    1085.7    3825.00
      1     1150.36   54.07    1.037  0.25( 0.12) 0.48    1393.1    3804.00
      2       30.00   22.00    1.737  0.25( 0.07) 0.27      25.0    3744.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1      938.61   22.00    1.737  0.25( 0.12) 0.47     648.9    3744.00
      2      945.81   22.48    1.716  0.25( 0.12) 0.47     662.5    3732.00
      3      972.09   24.27    1.642  0.25( 0.12) 0.47     713.4       0.00
      4     1012.13   27.66    1.523  0.25( 0.12) 0.47     804.9    3738.00
```

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      5     1068.11   33.72    1.360  0.25( 0.12) 0.47     960.5    3844.00
      6     1086.22   36.16    1.307  0.25( 0.12) 0.47    1020.2    3833.00
      7     1110.77   39.96    1.234  0.25( 0.12) 0.47    1110.7    3825.00
      8     1167.79   54.07    1.037  0.25( 0.12) 0.48    1418.1    3804.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =    1167.79    Tc(MIN.) =    54.07
  EFFECTIVE AREA(ACRES) =    1418.10   AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.48
  TOTAL AREA(ACRES) =     1418.1
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   3745.00 =    3817.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3745.00 TO NODE   3746.00 IS CODE =  43
----------------------------------------------------------------------------
  >>>>>COMPUTE COUPLED PIPEFLOW/STREETFLOW THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE(EXISTING) (PRESSURE FLOW)<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    40.39
  DOWNSTREAM NODE ELEVATION(FEET) =    39.40
  FLOW LENGTH(FEET) =   385.00   MANNING'S N =  0.013

  USER SPECIFIED PIPE DIAMETER(INCH) =  66.00    NUMBER OF PIPES =   1
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.98
  PIPE-FLOW(CFS) =     166.00
  PIPEFLOW TRAVEL TIME(MIN.) =   0.92    Tc(MIN.) =  54.99
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.028
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        1.50      0.25     0.100    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.50      SUBAREA RUNOFF(CFS) =    1.35
  EFFECTIVE AREA(ACRES) =   1419.60    AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.48
  TOTAL AREA(ACRES) =     1419.6        PEAK FLOW RATE(CFS) =    1167.79
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

  STREET CROSS-SECTION INFORMATION:
  CURB HEIGHT(INCHES) =  8.0       STREET HALFWIDTH(FEET) = 43.00
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  38.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020
  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  MAXIMUM ALLOWABLE STREET FLOW DEPTH(FEET) =   0.57
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0300
  *NOTE: STREET-CAPACITY MAY BE EXCEEDED*
  STREETFLOW HYDRAULICS BASED ON MAINLINE Tc :
  STREET HYDRAULICS COMPUTED USING ESTIMATED FLOW(CFS) = 1001.79
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  2.06
    HALFSTREET FLOOD WIDTH(FEET) =  112.43
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.49
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    9.23
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   3746.00 =    4202.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3746.00 TO NODE   3747.00 IS CODE =  43
```

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----------------------------------------------------------------------------
  >>>>>COMPUTE COUPLED PIPEFLOW/STREETFLOW THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE(EXISTING) (PRESSURE FLOW)<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    39.27
  DOWNSTREAM NODE ELEVATION(FEET) =    39.07
  FLOW LENGTH(FEET) =   137.00   MANNING'S N =  0.013

  USER SPECIFIED PIPE DIAMETER(INCH) =  69.00    NUMBER OF PIPES =   1
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.42
  PIPE-FLOW(CFS) =     140.82
  *NOTE: USER SPECIFIED PIPE SYSTEM CAN NOT CARRY TOTAL UPSTREAM PIPEFLOW*
  PIPEFLOW TRAVEL TIME(MIN.) =   0.42    Tc(MIN.) =  55.42
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.023
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        2.60      0.25     0.100    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    2.60      SUBAREA RUNOFF(CFS) =    2.34
  EFFECTIVE AREA(ACRES) =   1422.20    AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.48
  TOTAL AREA(ACRES) =     1422.2        PEAK FLOW RATE(CFS) =    1167.79
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

  STREET CROSS-SECTION INFORMATION:
  CURB HEIGHT(INCHES) =  8.0       STREET HALFWIDTH(FEET) = 43.00
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  38.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020
  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  MAXIMUM ALLOWABLE STREET FLOW DEPTH(FEET) =   0.57
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0300
  *NOTE: STREET-CAPACITY MAY BE EXCEEDED*
  STREETFLOW HYDRAULICS BASED ON MAINLINE Tc :
  STREET HYDRAULICS COMPUTED USING ESTIMATED FLOW(CFS) = 1026.97
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  2.31
    HALFSTREET FLOOD WIDTH(FEET) =  125.31
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.61
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    8.36
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L =   137.0 FT WITH ELEVATION-DROP =   0.2 FT, IS    7.2 CFS,
         WHICH EXCEEDS THE SPECIFIED STREET CAPACITY AT NODE   3747.00
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   3747.00 =    4339.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3747.00 TO NODE   3747.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   55.42
  RAINFALL INTENSITY(INCH/HR) =   1.02
  AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.48
```

```
  EFFECTIVE STREAM AREA(ACRES) =    1422.20
  TOTAL STREAM AREA(ACRES) =    1422.20
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    1167.79

****************************************************************************
  FLOW PROCESS FROM NODE   3752.00 TO NODE   3747.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN.) =   24.60   RAINFALL INTENSITY(INCH/HR) =  1.63
  EFFECTIVE AREA(ACRES) =    31.30
  TOTAL AREA(ACRES) =    31.30        PEAK FLOW RATE(CFS) =     36.30
  AREA-AVERAGED Fm(INCH/HR) =   0.03  AREA-AVERAGED Fp(INCH/HR) =   0.25
  AREA-AVERAGED Ap =  0.12
  NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
        CONFLUENCE ANALYSES.

****************************************************************************
  FLOW PROCESS FROM NODE   3747.00 TO NODE   3747.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   24.60
  RAINFALL INTENSITY(INCH/HR) =   1.63
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.12
  EFFECTIVE STREAM AREA(ACRES) =      31.30
  TOTAL STREAM AREA(ACRES) =      31.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      36.30

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1      938.61   23.34    1.679  0.25( 0.12) 0.46     653.0    3744.00
      1      945.81   23.82    1.660  0.25( 0.12) 0.46     666.6    3732.00
      1      972.09   25.61    1.592  0.25( 0.12) 0.47     717.5       0.00
      1     1012.13   29.00    1.483  0.25( 0.12) 0.47     809.0    3738.00
      1     1068.11   35.07    1.330  0.25( 0.12) 0.47     964.6    3844.00
      1     1086.22   37.50    1.280  0.25( 0.12) 0.47    1024.3    3833.00
      1     1110.77   41.30    1.211  0.25( 0.12) 0.47    1114.8    3825.00
      1     1167.79   55.42    1.023  0.25( 0.12) 0.48    1422.2    3804.00
      2       36.30   24.60    1.629  0.25( 0.03) 0.12      31.3    3752.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1      974.13   23.34    1.679  0.25( 0.11) 0.45     682.7    3744.00
      2      981.63   23.82    1.660  0.25( 0.11) 0.45     696.9    3732.00
      3      993.58   24.60    1.629  0.25( 0.11) 0.45     720.1    3752.00
      4     1007.55   25.61    1.592  0.25( 0.11) 0.45     748.8       0.00
      5     1045.10   29.00    1.483  0.25( 0.11) 0.45     840.3    3738.00
      6     1097.62   35.07    1.330  0.25( 0.11) 0.46     995.9    3844.00
      7     1114.58   37.50    1.280  0.25( 0.11) 0.46    1055.6    3833.00
      8     1137.57   41.30    1.211  0.25( 0.11) 0.46    1146.1    3825.00
      9     1190.33   55.42    1.023  0.25( 0.12) 0.47    1453.5    3804.00
```

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =    1190.33    Tc(MIN.) =    55.42
  EFFECTIVE AREA(ACRES) =    1453.50   AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.47
  TOTAL AREA(ACRES) =     1453.5
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   3747.00 =    4339.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3747.00 TO NODE   3766.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    39.07  DOWNSTREAM(FEET) =    38.47
  FLOW LENGTH(FEET) =   300.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.35
  (PIPE FLOW VELOCITY CORRESPONDING TO FULL PIPE CAPACITY FLOW)
  GIVEN PIPE DIAMETER(INCH) =  69.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =    1190.33
  PIPE TRAVEL TIME(MIN.) =   0.79    Tc(MIN.) =   56.20
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   3766.00 =    4639.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3766.00 TO NODE   3766.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   56.20
  RAINFALL INTENSITY(INCH/HR) =   1.01
  AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.47
  EFFECTIVE STREAM AREA(ACRES) =    1453.50
  TOTAL STREAM AREA(ACRES) =    1453.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    1190.33

****************************************************************************
  FLOW PROCESS FROM NODE   3761.00 TO NODE   3761.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   735.00
  ELEVATION DATA: UPSTREAM(FEET) =     73.00  DOWNSTREAM(FEET) =     66.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.805
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.610
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        5.00      0.25     0.100    69   10.81
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C        0.10      0.25     0.500    69   13.83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.108
  SUBAREA RUNOFF(CFS) =     11.86
  TOTAL AREA(ACRES) =      5.10   PEAK FLOW RATE(CFS) =     11.86
```

```
****************************************************************************
  FLOW PROCESS FROM NODE   3761.00 TO NODE   3762.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   66.00  DOWNSTREAM ELEVATION(FEET) =   65.00
  STREET LENGTH(FEET) =   315.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 18.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  13.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      17.00
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.56
    HALFSTREET FLOOD WIDTH(FEET) =   18.00
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.05
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.14
  STREET FLOW TRAVEL TIME(MIN.) =   2.56   Tc(MIN.) =   13.36
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.311
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        2.60      0.25     0.100    69
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C        2.50      0.25     0.500    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.296
  SUBAREA AREA(ACRES) =    5.10      SUBAREA RUNOFF(CFS) =   10.27
  EFFECTIVE AREA(ACRES) =     10.20    AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       10.2        PEAK FLOW RATE(CFS) =      20.75

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.59   HALFSTREET FLOOD WIDTH(FEET) =  18.00
  FLOW VELOCITY(FEET/SEC.) =  2.22   DEPTH*VELOCITY(FT*FT/SEC.) =   1.30
  LONGEST FLOWPATH FROM NODE   3761.00 TO NODE   3762.00 =    1050.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3762.00 TO NODE   3763.00 IS CODE =  43
----------------------------------------------------------------------------
  >>>>>COMPUTE COUPLED PIPEFLOW/STREETFLOW THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE(EXISTING) (PRESSURE FLOW)<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    49.10
  DOWNSTREAM NODE ELEVATION(FEET) =    47.10
  FLOW LENGTH(FEET) =  1000.00   MANNING'S N =  0.013

  USER SPECIFIED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.14
  PIPE-FLOW(CFS) =       9.86
  PIPEFLOW TRAVEL TIME(MIN.) =   5.32    Tc(MIN.) =  18.68
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.908
  SUBAREA LOSS RATE DATA(AMC  II):
```

```
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  C        7.30      0.25      0.100    69
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"        C        6.10      0.25      0.500    69
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"        C        0.80      0.25      0.600    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.300
  SUBAREA AREA(ACRES) =   14.20      SUBAREA RUNOFF(CFS) =   23.42
  EFFECTIVE AREA(ACRES) =     24.40    AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.26
  TOTAL AREA(ACRES) =       24.4        PEAK FLOW RATE(CFS) =      40.47

  STREET CROSS-SECTION INFORMATION:
  CURB HEIGHT(INCHES) =  8.0       STREET HALFWIDTH(FEET) = 35.00
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  30.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020
  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  MAXIMUM ALLOWABLE STREET FLOW DEPTH(FEET) =   0.57
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0300
  *NOTE: STREET-CAPACITY MAY BE EXCEEDED*
  STREETFLOW HYDRAULICS BASED ON MAINLINE Tc :
  STREET HYDRAULICS COMPUTED USING ESTIMATED FLOW(CFS) =   30.61
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.72
    HALFSTREET FLOOD WIDTH(FEET) =   30.69
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.88
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.35
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L =  1000.0 FT WITH ELEVATION-DROP =   2.0 FT, IS   25.0 CFS,
         WHICH EXCEEDS THE SPECIFIED STREET CAPACITY AT NODE   3763.00
  LONGEST FLOWPATH FROM NODE   3761.00 TO NODE   3763.00 =    2050.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3763.00 TO NODE   3764.00 IS CODE =  43
----------------------------------------------------------------------------
  >>>>>COMPUTE COUPLED PIPEFLOW/STREETFLOW THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE(EXISTING) (PRESSURE FLOW)<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    47.10
  DOWNSTREAM NODE ELEVATION(FEET) =    45.10
  FLOW LENGTH(FEET) =  1000.00   MANNING'S N =  0.013

  USER SPECIFIED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.88
  PIPE-FLOW(CFS) =      23.05
  PIPEFLOW TRAVEL TIME(MIN.) =   4.30    Tc(MIN.) =  22.98
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.694
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  C        3.40      0.25      0.100    69
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"        C       10.60      0.25      0.500    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.403
  SUBAREA AREA(ACRES) =   14.00      SUBAREA RUNOFF(CFS) =   20.08
  EFFECTIVE AREA(ACRES) =     38.40    AREA-AVERAGED Fm(INCH/HR) =  0.08
```

```
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.31
  TOTAL AREA(ACRES) =       38.4        PEAK FLOW RATE(CFS) =      55.86

  STREET CROSS-SECTION INFORMATION:
  CURB HEIGHT(INCHES) =  8.0       STREET HALFWIDTH(FEET) = 35.00
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  30.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020
  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  MAXIMUM ALLOWABLE STREET FLOW DEPTH(FEET) =   0.57
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0300
  *NOTE: STREET-CAPACITY MAY BE EXCEEDED*
  STREETFLOW HYDRAULICS BASED ON MAINLINE Tc :
  STREET HYDRAULICS COMPUTED USING ESTIMATED FLOW(CFS) =   32.81
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.73
    HALFSTREET FLOOD WIDTH(FEET) =   32.22
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.91
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.40
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L =  1000.0 FT WITH ELEVATION-DROP =   2.0 FT, IS   24.4 CFS,
         WHICH EXCEEDS THE SPECIFIED STREET CAPACITY AT NODE   3764.00
  LONGEST FLOWPATH FROM NODE   3761.00 TO NODE   3764.00 =    3050.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3764.00 TO NODE   3765.00 IS CODE =  43
----------------------------------------------------------------------------
  >>>>>COMPUTE COUPLED PIPEFLOW/STREETFLOW THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE(EXISTING) (PRESSURE FLOW)<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    45.10
  DOWNSTREAM NODE ELEVATION(FEET) =    42.90
  FLOW LENGTH(FEET) =  1100.00   MANNING'S N =  0.013

  USER SPECIFIED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.11
  PIPE-FLOW(CFS) =      29.07
  PIPEFLOW TRAVEL TIME(MIN.) =   4.46    Tc(MIN.) =  27.44
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.530
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        5.20      0.25     0.100    69
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C        9.00      0.25     0.500    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.354
  SUBAREA AREA(ACRES) =   14.20      SUBAREA RUNOFF(CFS) =   18.43
  EFFECTIVE AREA(ACRES) =     52.60    AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.32
  TOTAL AREA(ACRES) =       52.6        PEAK FLOW RATE(CFS) =      68.63

  STREET CROSS-SECTION INFORMATION:
  CURB HEIGHT(INCHES) =  8.0       STREET HALFWIDTH(FEET) = 35.00
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  30.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020
  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  MAXIMUM ALLOWABLE STREET FLOW DEPTH(FEET) =   0.57
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
```

```
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0300
  *NOTE: STREET-CAPACITY MAY BE EXCEEDED*
  STREETFLOW HYDRAULICS BASED ON MAINLINE Tc :
  STREET HYDRAULICS COMPUTED USING ESTIMATED FLOW(CFS) =   39.56
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.78
    HALFSTREET FLOOD WIDTH(FEET) =   36.43
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.97
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.53
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L =  1100.0 FT WITH ELEVATION-DROP =   2.2 FT, IS   24.3 CFS,
         WHICH EXCEEDS THE SPECIFIED STREET CAPACITY AT NODE   3765.00
  LONGEST FLOWPATH FROM NODE   3761.00 TO NODE   3765.00 =    4150.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3765.00 TO NODE   3766.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    42.90  DOWNSTREAM(FEET) =    42.26
  FLOW LENGTH(FEET) =   320.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.56
  (PIPE FLOW VELOCITY CORRESPONDING TO FULL PIPE CAPACITY FLOW)
  GIVEN PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      68.63
  PIPE TRAVEL TIME(MIN.) =   1.17    Tc(MIN.) =   28.61
  LONGEST FLOWPATH FROM NODE   3761.00 TO NODE   3766.00 =    4470.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3766.00 TO NODE   3766.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   28.61
  RAINFALL INTENSITY(INCH/HR) =   1.49
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.32
  EFFECTIVE STREAM AREA(ACRES) =      52.60
  TOTAL STREAM AREA(ACRES) =      52.60
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      68.63

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1      974.13   24.13    1.647  0.25( 0.11) 0.45     682.7    3744.00
      1      981.63   24.61    1.629  0.25( 0.11) 0.45     696.9    3732.00
      1      993.58   25.39    1.600  0.25( 0.11) 0.45     720.1    3752.00
      1     1007.55   26.39    1.565  0.25( 0.11) 0.45     748.8       0.00
      1     1045.10   29.78    1.460  0.25( 0.11) 0.45     840.3    3738.00
      1     1097.62   35.85    1.313  0.25( 0.11) 0.46     995.9    3844.00
      1     1114.58   38.29    1.264  0.25( 0.11) 0.46    1055.6    3833.00
      1     1137.57   42.08    1.198  0.25( 0.11) 0.46    1146.1    3825.00
      1     1190.33   56.20    1.015  0.25( 0.12) 0.47    1453.5    3804.00
      2       68.63   28.61    1.494  0.25( 0.08) 0.32      52.6    3761.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
```

```
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1     1038.28   24.13    1.647  0.25( 0.11) 0.44     727.1    3744.00
      2     1046.29   24.61    1.629  0.25( 0.11) 0.44     742.2    3732.00
      3     1059.04   25.39    1.600  0.25( 0.11) 0.44     766.8    3752.00
      4     1074.02   26.39    1.565  0.25( 0.11) 0.44     797.4       0.00
      5     1100.71   28.61    1.494  0.25( 0.11) 0.45     861.2    3761.00
      6     1112.07   29.78    1.460  0.25( 0.11) 0.45     892.9    3738.00
      7     1157.44   35.85    1.313  0.25( 0.11) 0.45    1048.5    3844.00
      8     1172.05   38.29    1.264  0.25( 0.11) 0.45    1108.2    3833.00
      9     1191.81   42.08    1.198  0.25( 0.11) 0.45    1198.7    3825.00
     10     1235.68   56.20    1.015  0.25( 0.12) 0.46    1506.1    3804.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =    1235.68    Tc(MIN.) =    56.20
  EFFECTIVE AREA(ACRES) =    1506.10   AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.46
  TOTAL AREA(ACRES) =     1506.1
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   3766.00 =    4639.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3766.00 TO NODE   3767.00 IS CODE =  43
----------------------------------------------------------------------------
  >>>>>COMPUTE COUPLED PIPEFLOW/STREETFLOW THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE(EXISTING) (PRESSURE FLOW)<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    38.47
  DOWNSTREAM NODE ELEVATION(FEET) =    36.07
  FLOW LENGTH(FEET) =  1200.00   MANNING'S N =  0.013

  USER SPECIFIED PIPE DIAMETER(INCH) =  69.00    NUMBER OF PIPES =   1
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.34
  PIPE-FLOW(CFS) =     164.83
  *NOTE: USER SPECIFIED PIPE SYSTEM CAN NOT CARRY TOTAL UPSTREAM PIPEFLOW*
  PIPEFLOW TRAVEL TIME(MIN.) =   3.15    Tc(MIN.) =  59.36
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  0.984
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        7.90      0.25     0.100    69
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C        9.40      0.25     0.500    69
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       D        0.10      0.20     0.500    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.318
  SUBAREA AREA(ACRES) =   17.40      SUBAREA RUNOFF(CFS) =   14.16
  EFFECTIVE AREA(ACRES) =   1523.50    AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.46
  TOTAL AREA(ACRES) =     1523.5        PEAK FLOW RATE(CFS) =    1235.68
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

  STREET CROSS-SECTION INFORMATION:
  CURB HEIGHT(INCHES) =  8.0       STREET HALFWIDTH(FEET) = 40.00
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  35.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020
  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  MAXIMUM ALLOWABLE STREET FLOW DEPTH(FEET) =   0.57
```

```
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0300
  *NOTE: STREET-CAPACITY MAY BE EXCEEDED*
  STREETFLOW HYDRAULICS BASED ON MAINLINE Tc :
  STREET HYDRAULICS COMPUTED USING ESTIMATED FLOW(CFS) = 1070.85
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  2.24
    HALFSTREET FLOOD WIDTH(FEET) =  118.70
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.14
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    9.27
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L =  1200.0 FT WITH ELEVATION-DROP =   2.4 FT, IS   29.3 CFS,
         WHICH EXCEEDS THE SPECIFIED STREET CAPACITY AT NODE   3767.00
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   3767.00 =    5839.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   3767.00 TO NODE   3704.00 IS CODE =  43
----------------------------------------------------------------------------
  >>>>>COMPUTE COUPLED PIPEFLOW/STREETFLOW THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE(EXISTING) (PRESSURE FLOW)<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    36.07
  DOWNSTREAM NODE ELEVATION(FEET) =    33.91
  FLOW LENGTH(FEET) =  1080.00   MANNING'S N =  0.013

  USER SPECIFIED PIPE DIAMETER(INCH) =  69.00    NUMBER OF PIPES =   1
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.34
  PIPE-FLOW(CFS) =     164.83
  *NOTE: USER SPECIFIED PIPE SYSTEM CAN NOT CARRY TOTAL UPSTREAM PIPEFLOW*
  PIPEFLOW TRAVEL TIME(MIN.) =   2.84    Tc(MIN.) =  62.19
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  0.958
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       C        6.50      0.25     0.500    69
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        4.30      0.25     0.600    69
  RESIDENTIAL
  "5-7 DWELLINGS/ACRE"       D        0.10      0.20     0.500    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.539
  SUBAREA AREA(ACRES) =   10.90      SUBAREA RUNOFF(CFS) =    8.07
  EFFECTIVE AREA(ACRES) =   1534.40    AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.46
  TOTAL AREA(ACRES) =     1534.4        PEAK FLOW RATE(CFS) =    1235.68
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

  STREET CROSS-SECTION INFORMATION:
  CURB HEIGHT(INCHES) =  8.0       STREET HALFWIDTH(FEET) = 35.00
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  30.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020
  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  MAXIMUM ALLOWABLE STREET FLOW DEPTH(FEET) =   0.57
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0300
  *NOTE: STREET-CAPACITY MAY BE EXCEEDED*
  STREETFLOW HYDRAULICS BASED ON MAINLINE Tc :
```

```
  STREET HYDRAULICS COMPUTED USING ESTIMATED FLOW(CFS) = 1070.85
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  2.30
    HALFSTREET FLOOD WIDTH(FEET) =  116.69
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.13
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    9.50
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L =  1080.0 FT WITH ELEVATION-DROP =   2.2 FT, IS   15.7 CFS,
         WHICH EXCEEDS THE SPECIFIED STREET CAPACITY AT NODE   3704.00
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   3704.00 =    6919.00 FEET.
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =     1534.4  TC(MIN.) =     62.19
  EFFECTIVE AREA(ACRES) =   1534.40  AREA-AVERAGED Fm(INCH/HR)=  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.461
  PEAK FLOW RATE(CFS)   =    1235.68

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1     1038.28   30.12    1.451  0.25( 0.11) 0.44     755.4    3744.00
      2     1046.29   30.60    1.438  0.25( 0.11) 0.44     770.5    3732.00
      3     1059.04   31.38    1.417  0.25( 0.11) 0.44     795.1    3752.00
      4     1074.02   32.39    1.392  0.25( 0.11) 0.44     825.7       0.00
      5     1100.71   34.60    1.340  0.25( 0.11) 0.44     889.5    3761.00
      6     1112.07   35.78    1.315  0.25( 0.11) 0.45     921.2    3738.00
      7     1157.44   41.84    1.202  0.25( 0.11) 0.45    1076.8    3844.00
      8     1172.05   44.28    1.163  0.25( 0.11) 0.45    1136.5    3833.00
      9     1191.81   48.08    1.110  0.25( 0.11) 0.45    1227.0    3825.00
     10     1235.68   62.19    0.958  0.25( 0.12) 0.46    1534.4    3804.00
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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             Ver. 15.0  Release Date: 04/01/2008  License ID 1619

                          Analysis prepared by:

                                IBI Group
                          10 Exchange Place, Suite 112
                            Salt Lake City, UT 84111


--------------------------------------------------------------------------
  FILE NAME: HYDRO_E.DAT
  TIME/DATE OF STUDY: 15:03 05/29/2009
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *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
  2   43.0     38.0    0.020/0.020/0.020   0.67    2.00 0.0312 0.167 0.0150
  3   40.0     35.0    0.020/0.020/0.020   0.67    2.00 0.0312 0.167 0.0150
  4   38.0     33.0    0.020/0.020/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.10 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.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE      0.00 TO NODE   4705.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =  1060.00
  ELEVATION DATA: UPSTREAM(FEET) =     64.00  DOWNSTREAM(FEET) =     62.56

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   18.467
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.920
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        9.50      0.25      0.100    69   18.47
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
```

```
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     16.20
  TOTAL AREA(ACRES) =      9.50   PEAK FLOW RATE(CFS) =     16.20

****************************************************************************
  FLOW PROCESS FROM NODE   4705.00 TO NODE   4705.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   18.47
  RAINFALL INTENSITY(INCH/HR) =   1.92
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       9.50
  TOTAL STREAM AREA(ACRES) =       9.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      16.20

****************************************************************************
  FLOW PROCESS FROM NODE   4704.00 TO NODE   4705.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN.) =   25.90   RAINFALL INTENSITY(INCH/HR) =  1.58
  EFFECTIVE AREA(ACRES) =   277.50
  TOTAL AREA(ACRES) =   277.50        PEAK FLOW RATE(CFS) =    342.10
  AREA-AVERAGED Fm(INCH/HR) =   0.03  AREA-AVERAGED Fp(INCH/HR) =   0.25
  AREA-AVERAGED Ap =  0.10
  NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
        CONFLUENCE ANALYSES.

****************************************************************************
  FLOW PROCESS FROM NODE   4705.00 TO NODE   4705.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   25.90
  RAINFALL INTENSITY(INCH/HR) =   1.58
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =     277.50
  TOTAL STREAM AREA(ACRES) =     277.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     342.10

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       16.20   18.47    1.920  0.25( 0.03) 0.10       9.5       0.00
      2      342.10   25.90    1.582  0.25( 0.03) 0.10     277.5    4704.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
```

```
      1      313.13   18.47    1.920  0.25( 0.03) 0.10     207.4       0.00
      2      355.41   25.90    1.582  0.25( 0.03) 0.10     287.0    4704.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     355.41    Tc(MIN.) =    25.90
  EFFECTIVE AREA(ACRES) =     287.00   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =      287.0
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   4705.00 =    1060.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   4705.00 TO NODE   4706.00 IS CODE =  46
----------------------------------------------------------------------------
  >>>>>COMPUTE BOX-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED BOX SIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    51.75  DOWNSTREAM(FEET) =    48.00
  FLOW LENGTH(FEET) =  1041.60   MANNING'S N =  0.013
  GIVEN BOX BASEWIDTH(FEET) =   7.00   GIVEN BOX HEIGHT(FEET) =   6.00
  FLOWDEPTH IN BOX IS  4.66 FEET   BOX-FLOW VELOCITY(FEET/SEC.) =  10.89
  BOX-FLOW(CFS) =     355.41
  BOX-FLOW TRAVEL TIME(MIN.) =   1.59    Tc(MIN.) =   27.49
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   4706.00 =    2101.60 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   4706.00 TO NODE   4706.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   27.49
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.529
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        5.90      0.25      0.100    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    5.90      SUBAREA RUNOFF(CFS) =    7.98
  EFFECTIVE AREA(ACRES) =    292.90   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =      292.9       PEAK FLOW RATE(CFS) =     396.36

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1      346.51   20.08    1.830  0.25( 0.03) 0.10     213.3       0.00
      2      396.89   27.43    1.531  0.25( 0.03) 0.10     292.9    4704.00
  NEW PEAK FLOW DATA ARE:
  PEAK FLOW RATE(CFS) =     396.89  Tc(MIN.) =   27.43
  AREA-AVERAGED Fm(INCH/HR) =  0.03  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10  EFFECTIVE AREA(ACRES) =     292.90

****************************************************************************
  FLOW PROCESS FROM NODE   4706.00 TO NODE   4707.00 IS CODE =  46
----------------------------------------------------------------------------
  >>>>>COMPUTE BOX-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED BOX SIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    48.00  DOWNSTREAM(FEET) =    47.56
  FLOW LENGTH(FEET) =   133.00   MANNING'S N =  0.013
  GIVEN BOX BASEWIDTH(FEET) =   7.00   GIVEN BOX HEIGHT(FEET) =   6.00
  ASSUME FULL-FLOWING BOX   BOX-FLOW VELOCITY(FEET/SEC.) =   9.45
  BOX-FLOW(CFS) =     396.89
```

```
  BOX-FLOW TRAVEL TIME(MIN.) =   0.23    Tc(MIN.) =   27.67
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   4707.00 =    2234.60 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   4707.00 TO NODE   4707.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   27.67
  RAINFALL INTENSITY(INCH/HR) =   1.52
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =     292.90
  TOTAL STREAM AREA(ACRES) =     292.90
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     396.89

****************************************************************************
  FLOW PROCESS FROM NODE   4738.00 TO NODE   4739.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN.) =   26.90   RAINFALL INTENSITY(INCH/HR) =  1.55
  EFFECTIVE AREA(ACRES) =    36.10
  TOTAL AREA(ACRES) =    36.10        PEAK FLOW RATE(CFS) =     36.60
  AREA-AVERAGED Fm(INCH/HR) =   0.12  AREA-AVERAGED Fp(INCH/HR) =   0.25
  AREA-AVERAGED Ap =  0.50
  NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
        CONFLUENCE ANALYSES.

****************************************************************************
  FLOW PROCESS FROM NODE   4739.00 TO NODE   4707.00 IS CODE =  43
----------------------------------------------------------------------------
  >>>>>COMPUTE COUPLED PIPEFLOW/STREETFLOW THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING) (NON-PRESSURE FLOW)<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    50.54
  DOWNSTREAM NODE ELEVATION(FEET) =    47.61
  FLOW LENGTH(FEET) =   671.00   MANNING'S N =  0.013

  USER SPECIFIED PIPE DIAMETER(INCH) =  60.00    NUMBER OF PIPES =   1
  DEPTH OF FLOW IN  60.0 INCH PIPE IS  18.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.96
  PIPE-FLOW(CFS) =      36.60
  *NOTE: USER SPECIFIED PIPE SYSTEM CAN CARRY TOTAL UPSTREAM FLOW*
  PIPEFLOW TRAVEL TIME(MIN.) =   1.64    Tc(MIN.) =  28.54
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.496
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C       16.10      0.25     0.100    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =   16.10      SUBAREA RUNOFF(CFS) =   21.32
  EFFECTIVE AREA(ACRES) =     52.20    AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.38
  TOTAL AREA(ACRES) =       52.2        PEAK FLOW RATE(CFS) =      65.88

  STREET CROSS-SECTION INFORMATION:
  CURB HEIGHT(INCHES) =  8.0       STREET HALFWIDTH(FEET) = 43.00
```

```
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  38.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020
  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  MAXIMUM ALLOWABLE STREET FLOW DEPTH(FEET) =   0.77
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0300
  STREETFLOW HYDRAULICS BASED ON MAINLINE Tc :
  STREET HYDRAULICS COMPUTED USING ESTIMATED FLOW(CFS) =   29.28
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.63
    HALFSTREET FLOOD WIDTH(FEET) =   23.74
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.51
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.59
  LONGEST FLOWPATH FROM NODE   4738.00 TO NODE   4707.00 =     671.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   4707.00 TO NODE   4707.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   28.54
  RAINFALL INTENSITY(INCH/HR) =   1.50
  AREA-AVERAGED Fm(INCH/HR) =  0.09
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.38
  EFFECTIVE STREAM AREA(ACRES) =      52.20
  TOTAL STREAM AREA(ACRES) =      52.20
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      65.88

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1      346.51   20.29    1.819  0.25( 0.03) 0.10     213.3       0.00
      1      396.89   27.67    1.523  0.25( 0.03) 0.10     292.9    4704.00
      2       65.88   28.54    1.496  0.25( 0.09) 0.38      52.2    4738.00

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

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1      404.14   20.29    1.819  0.25( 0.04) 0.14     250.4       0.00
      2      461.98   27.67    1.523  0.25( 0.04) 0.14     343.5    4704.00
      3      455.68   28.54    1.496  0.25( 0.04) 0.14     345.1    4738.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     461.98    Tc(MIN.) =    27.67
  EFFECTIVE AREA(ACRES) =     343.51   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.14
  TOTAL AREA(ACRES) =      345.1
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE   4707.00 =    2234.60 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   4749.00 TO NODE   4707.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
```

```
 MAINLINE Tc(MIN.) =   27.67
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.523
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 C      259.50      0.25     0.100    69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =  259.50      SUBAREA RUNOFF(CFS) =  349.89
 EFFECTIVE AREA(ACRES) =    603.01   AREA-AVERAGED Fm(INCH/HR) =  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.12
 TOTAL AREA(ACRES) =      604.6       PEAK FLOW RATE(CFS) =     809.91

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1      821.13   20.29    1.819  0.25( 0.03) 0.12     509.9       0.00
     2      809.91   27.67    1.523  0.25( 0.03) 0.12     603.0    4704.00
     3      797.39   28.54    1.496  0.25( 0.03) 0.12     604.6    4738.00
 NEW PEAK FLOW DATA ARE:
 PEAK FLOW RATE(CFS) =     821.13  Tc(MIN.) =   20.29
 AREA-AVERAGED Fm(INCH/HR) =  0.03  AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.12  EFFECTIVE AREA(ACRES) =     509.87
==========================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =      604.6  TC(MIN.) =     20.29
 EFFECTIVE AREA(ACRES) =    509.87  AREA-AVERAGED Fm(INCH/HR)=  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.120
 PEAK FLOW RATE(CFS)   =     821.13

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1      821.13   20.29    1.819  0.25( 0.03) 0.12     509.9       0.00
     2      809.91   27.67    1.523  0.25( 0.03) 0.12     603.0    4704.00
     3      797.39   28.54    1.496  0.25( 0.03) 0.12     604.6    4738.00
==========================================================================
==========================================================================
 END OF RATIONAL METHOD ANALYSIS
```

APPENDIX K: HYDRAULICS – PROPOSED CONDITION

MAIN STREET TO STANDARD AVE:

Summary of HGL Output (AES – Pipeflow):

Node	FL Elevation	MH Rim/ FS Elev	Maximum HGL (2' below gutter grade)*	Existing HGL	Proposed HGL
3826					
3834					
3845	47.91/47.94	57.80	55.80	1022.22	
3805	44.57/44.72	56.88	54.88	607.25	
3733	43.53				
3739	42.23	55.34	53.34	409.09	
3745	40.39/40.67				
3746	39.27/39.40	54.01	52.01	334.94	
3747	39.07	53.98	51.98	321.87	

*Assume Storm Drain is located at the CL of Warner Ave.

STANDARD AVE TO GRAND AVE:

Summary of HGL Output (AES – Pipeflow):

Node	FL Elevation	MH Rim/ FS Elev	Maximum HGL (2' below gutter grade)*	Existing HGL	Proposed HGL
4705	39.07	53.98	51.98	57.46	
4706	39.27/39.40	54.01	52.01	55.53	
4707	40.39/40.67				

*Assume Storm Drain is located at the CL of Warner Ave.

APPENDIX L: REFERENCES

1. Hromadka II, T.V.," Orange County Hydrology Manual", October, 1986

2. Local Drainage Committee, "Orange County Local Drainage Manual", County of Orange, Environmental Management Agency, Santa Ana, California; January, 1996

3. Advanced Engineering Software, AES Rational Method Hydrology Software package, 2008

4. Boyle Engineering, Drainage Study, 1993