PRELIMINARY DRAINAGE STUDY
FOR
MADISON AVENUE IMPROVEMENT PROJECT
FROM GUAVA STREET TO ELM STREET

Job Number 18099

March 6, 2024

RICK ENGINEERING COMPANY
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RICK ENGINEERING CO

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Job Number 18099

Jayne Janda-Timba
R.C.E. #70649
Exp. 06/25

Prepared for:

City of Murrieta
Engineering Department
1 Town Square
Murrieta, CA 92562
(951) 304-2489

Prepared by:

Rick Engineering Company
Water Resources Division
5620 Friars Road
San Diego, California 92110-2596
(619) 291-0707

March 6, 2024

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Map Pocket 1: Drainage Study Map, Off-site
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DECLARATION OF RESPONSIBLE CHARGE

I hereby declare that I am the engineer of work for drainage report for this project, that I have exercised responsible charge over this drainage report as defined in Section 6703 of the Business and Professionals Code and opine that the drainage report is consistent with current standards.

I understand that the check of the drainage report by the County of San Diego is confined to a review only and does not relieve me, as the engineer of work, of any responsibilities for the drainage report.

_____

Jayne Janda-Timba, PE
RCE # 70649, Exp. 06/25
Principal

1.0 INTRODUCTION

This preliminary drainage study presents hydrologic and hydraulic analyses for the proposed Madison Avenue Street Improvements project (herein referred to as "the project"). The project is located in the City of Murrieta, bounded by Guava Street to the west and Elm Street to the east. Refer to Figure 1.0 for a Vicinity Map of the project.

1.1 Project Description

The project consists of approximately 1 mile of roadway improvements between Guava Street and Elm Street. The proposed improvements consist of roadway widening, inlets, on-site storm drain systems, and culvert crossings. Additionally, to comply with the City of Murrieta's 2018 Water Quality Management Plan, dated June 2020, Green Street Exemption, the project incorporates green infrastructure.

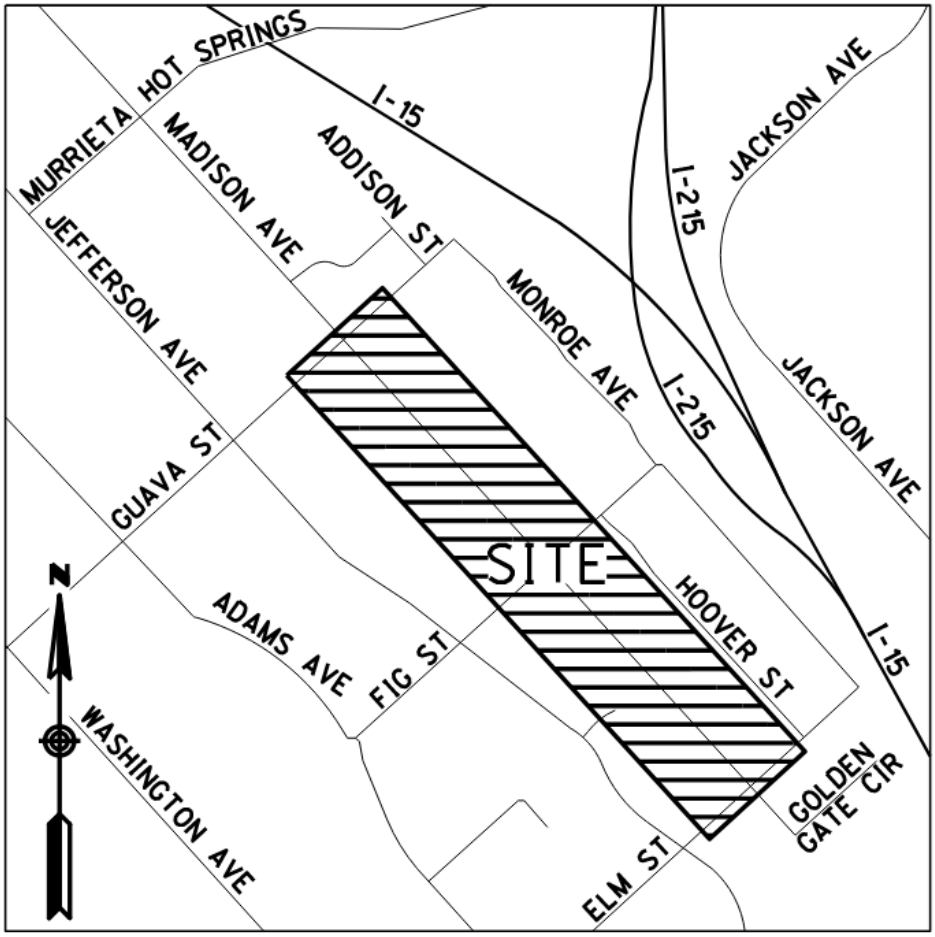


Figure 1-1: Vicinity Map

1.2 Land Use and Drainage Characteristics

In the existing condition, Madison Avenue between Guava Street and Elm Street is approximately one mile in length and consists of an existing road with dispersed asphalt concrete (AC) berm and culvert crossings. The culvert crossings at Madison Avenue provide conveyance for five major off-site drainage basins (Basin 100-500). The total off-site tributary area consists of approximately 413 acres of open, undeveloped space, with some commercial and rural residential developments. The culverts outfall into existing gulleys that eventually convey the runoff to the storm drain system along Jefferson Avenue. The project is located within the Murrieta Creek Master Drainage Plan within the Warm Springs Valley subwatershed. Reference Appendix A for the Murrieta Creek Area Drainage Plan Map.

The post-project condition for Madison Avenue will consist of a new vertical alignment, street widening, curb and gutter, storm drain inlets, and an on-site storm drain network. The on-site storm drain network will tie into proposed culvert crossings spanning Madison Avenue intended to convey on-site and off-site drainage, similar to existing drainage patterns. It is understood that drainage basin diversion greater than one acre is not allowed and on-grade curb inlets have been proposed to capture runoff where the new vertical alignment of Madison Avenue may differ from differ.

1.3 FEMA Flood Hazard Zone Information

The project is shown on the FEMA Flood Insurance Rate Map (FIRM) number 06065C2720G, effective August 28, 2008 and labeled as Zone X (un-shaded). No FEMA submittals are anticipated to be required for this project. Reference Appendix A for the FEMA FIRM.

1.4 Water Quality and Hydromodification Management

As part of the final engineering process, a Preliminary Green Street PDP Exemption Water Quality Management Plan (WQMP) has been prepared for the project to document the water quality approach. The report is titled, "Project Specific Water Quality Management Plan Green Street PDP Exemption for Madison Avenue Street Improvements from Guava Street to Elm Street," dated March 6, 2024, prepared by Rick Engineering Company (Job Number 18099). The WQMP documents the water quality approach for permanent stormwater quality in accordance with the stormwater guidance document titled, *2018 Water Quality Management Plan for the Santa Margarita Region of Riverside County*, dated June 2020. Since the project is PDP Exempt through Green Street implementation, the project is hydromodification exempt.

2.0 HYDROLOGY

Hydrologic calculations were computed in accordance with the Riverside County Flood Control and Water Conservation District - Hydrology Manual, dated April 1978 (manual). The Advanced Engineering Software (AES) 2014 Rational Method Analysis (Version 21.0) program was used to perform hydrologic analysis in this study for the 10- and 100-year storm event.

The AES hydrologic model is developed by creating independent node-link models of each interior drainage basin and linking these sub-models together at confluence points. The program has the capability to perform calculations for 15 hydrologic processes. These processes are assigned code numbers that appear in the results. The code numbers and their significances are as follows:

Table 2-1: Summary of AES Processes

Code	Subarea Type
Code 1	Confluence analysis at a node
Code 2	Initial subarea analysis
Code 3	Pipe flow travel time (computer-estimated pipe sizes)
Code 4	Pipe flow travel time (user-specified pipe size)
Code 5	Trapezoidal channel travel time
Code 6	Street flow analysis through a subarea
Code 7	User-specified information at a node
Code 8	Addition of the subarea runoff to mainline
Code 9	V-Gutter flow through subarea
Code 10	Copy mainstream data onto a memory bank
Code 11	Confluence a memory bank with the mainstream memory
Code 12	Clear a memory bank
Code 13	Clear the mainstream memory
Code 14	Copy a memory bank onto the mainstream memory
Code 15	Hydrologic data bank storage functions

To perform the hydrologic analysis, base information for the study area is required. This information includes the drainage facility locations and sizes, land uses, flow patterns, drainage basin boundaries, and topographic elevations. Compiled hydrologic backup is included as Appendix A to this report.

Area

Watersheds were delineated to distinguish areas with similar flow characteristics and hydrologic properties as well as to determine peak flows at confluence points, existing and proposed storm drain facilities, and to facilitate hydraulic analyses. Drainage basin boundaries were delineated for the on-site treatment areas and the off-site bypass areas draining through the proposed culvert crossings. Drainage basin boundaries, flow patterns, and topographic elevations are shown on the drainage study maps for the on-site and off-site areas, included in Map Pockets 1 and 2, respectively.

Time of Concentration/Intensity

The time of concentration was calculated using AES to determine the intensity for the 10- and 100-year storm events. The rainfall intensity was calculated in AES using the 10 and 60-minute intensity values from the National Oceanic and Atmospheric Administration (NOAA) Precipitation Data Frequency Server at the project location. An annotated chart has been included in Appendix A

Runoff Coefficient

The runoff coefficients used for each minor basin were calculated by the AES software based on the user-entered information of the hydrologic soil group and the land use for each basin. Hydrologic soil group data is available for the site through the Natural Resource Conservation Service (NRCS) Web Soil Survey, showing the majority of the site as type "C" and "D" soil. For the purposes of on-site analyses, type "D" soil is used with Commercial land use. For off-site analyses, per the City of Murrieta's direction, the runoff coefficient reflects the General Plan 2035 land use map. Only the subarea land use for the off-site drainage area has been modified and the rational method routing has remained the same as in the existing hydrology.

2.1 Rational Method Hydrologic Analysis Results

Table 2-2 provides a summary of off-site drainage 100-year peak flow rates. Reference Appendix B for the AES output of off-site drainage analyses. The resulting peak flow rates were used to size the culvert crossings as Madison Avenue.

Table 2-2: Summary of Off-Site Drainage Rational Method Calculations

Basin ID	Area (acres)	Tc (Minutes)	Peak Flow Rate (CFS)
100	157.5	23.8	360
200	43.1	21.9	96
300	4.8	7.2	18
400	165.9	20.2	407
500	41.7	22.5	87

Table 2-3 provides a summary of on-site 100-year peak flow rates at key locations for the proposed condition. Reference Appendix C for AES output of on-site drainage analyses. The resulting peak flow rates were used to size on-site inlets and storm drain networks, documented in Section 3.0 of this report.

Table 2-3. Summary of On-Site Drainage Rational Method Calculations

Basin ID	Area (acres)	Tc (Minutes)	Peak Flow Rate (CFS)
600	1.7	8.2	6.3
700	1.6	8.2	5.8
800	0.9	8.8	3.1
900	1.2	8.5	4.4
1000	1.2	7.8	4.5
1100	1.1	8.5	3.8
1200	0.9	9.8	3.3
1300	0.8	9.9	3.8
1400	0.5	12.3	1.5
1500	1.0	11.0	3.1
1600	0.1	5.9	0.6
1700	0.2	5.9	0.95

It is anticipated that due to the street widening, there will be an increase in runoff when compared to the existing condition. If determined during final engineering that flow mitigation is required, a detention analysis will be prepared, and a potential detention facility will be sited and designed.

3.0 HYDRAULIC ANALYSIS

3.1 Hydraulic Methodology and Criteria

The 100-year proposed peak flow rates determined using the Modified Rational Method were used to size storm water conveyance infrastructure. Preliminary hydraulic calculations were performed for sizing on-site inlets, storm drains, and culvert crossings utilizing methodology described in the Riverside County Flood Control and Water Conservation District Hydraulic Design Manual, dated 2023.

3.2 Curb Inlet Sizing

Inlet design calculations were completed using the FlowMaster computer program based on the flow rates calculated by modified rational method for the 100-year storm event. The inlets for Basins 600-900 and 1200-1300 were designed as inlets in sump. Inlets for Basins 1000-1100 and 1400-1700 were designed as on-grade inlets to capture 100 percent of runoff to maintain existing drainage patterns. The inlet design calculations are provided in Appendix D. Dry Lane calculations are to be provided in final engineering.

3.3 Storm Drain Sizing

The proposed storm drain pipe sizes were designed using Manning's equation at this time along with the "30% bump up" to account for anticipated head loss (i.e. – friction loss, junction loss) within the proposed storm drain system. A summary of storm drain sizes is provided in Appendix E. The Riverside County Flood Control and Water Conservation District Hydraulic Design Manual recommends a minimum pipe size of 18-inch for laterals. It is anticipated that during final engineering Water Surface Pressure Gradient for Windows (WSPGW) modeling software will be utilized for storm drain sizing.

3.4 Culvert Sizing

The proposed culverts were sized for the ultimate buildout condition based on the 2035 Land Use by the City of Murieta, attached in Appendix F. The proposed culvert sizes were designed using Manning's equation at this time along with the "30% bump up" to account for anticipated head loss (i.e. – friction loss, junction loss) within the proposed storm drain system. The nomograph for "Inlet Control Headwater Depth for Concrete Pipe Culverts" from The Riverside County Flood Control and Water Conservation District Hydraulic Design Manual was used to confirm that 1 foot of freeboard was available between the predicted headwater depth and the centerline of the road. A summary of culvert sizes and supporting material are provided in Appendix F. It is anticipated that during final engineering Water Surface Pressure Gradient for Windows (WSPGW) modeling software will be utilized for culvert sizing.

4.0 CEQA DETERMINATION OF SIGNIFICANCE

This study evaluated the California Environmental Quality Act (CEQA) level potential for adverse environmental impacts by providing responses to following the questions:

Would the project:

- Violate any water quality standards or waste discharge requirements.
    - The project will not violate any water quality standards or waste discharge requirements. Green street infrastructure is proposed to treat the net increase in impervious area proposed by the project site.

- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted).
    - The project will not substantially deplete groundwater supplies or interfere substantially with groundwater recharge.

- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of stream or river, in a manner which would result in substantial erosion or siltation on- or off-site.
    - The project will not substantially alter the existing drainage pattern of the site or area that would result in substantial erosions or siltation on- or off-site.

- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site?
    - The project will not substantially increase the amount or rate of surface runoff or the existing drainage pattern that would result in flooding on-or off-site.

- Create or contribute runoff water, which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?
    - The project proposes storm drain infrastructure designed to consider the future 2035 land use for the City of Murrieta. Water quality measures designed in accordance with the City of Murrieta WQMP are proposed to treat runoff from the net increase in impervious areas. The proposed development will not significantly increase the amount or rate of runoff.

- Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary, a Flood Insurance Rate Map or another flood hazard delineation map?

    - The project area is not mapped on a federal Flood Hazard Boundary, a Flood Insurance Rate Map, or another flood hazard delineation map.

- Place within a 100-year flood hazard area structures, which would impede or redirect flood flows?

    - The project does not propose structures within a 100-year flood hazard area that would impede or redirect flows significantly.

- Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?

    - No levees or dams exist within the drainage areas to the project, and no levees or dams are proposed by the project.

- Inundation by seiche, tsunami, or mudflow?


    - The project site is not subject to inundation by seiche, tsunami, or mudflow.

5.0 SUMMARY AND CONCLUSION

This preliminary drainage study presents hydrologic and hydraulic analyses for the proposed Madison Avenue Street Improvements from Guava Street to Elm Street. Hydrologic calculations were computed in accordance with the Riverside County Flood Control and Water Conservation District - Hydrology Manual, dated April 1978 (manual). The Advanced Engineering Software (AES) 2014 Rational Method Analysis (Version 21.0) program was used for the rational method modeling in this study. The discharges for the 100-year storm events have been calculated for the project on-site and off-site area. Hydraulic calculations were performed to size on-site inlets, storm drains, and culvert crossings.

Appendix A

Hydrologic Support


WILDOMAR VALLEY
FOR FACILITIES IN THIS AREA SEE WILDOMAR M.D.P. MAP.
McVICAR STREET
LINE J
LINE H
LAGUNA
LINE G
NUTMEG ST
LINE K
MAGNOLIA ST
LINE F-1
LINE F-2
LINE F-3
LINE F
LEMON ST
TENAJA ROAD
KALMIA
LINE L-1
LINE L
Murrieta
LINE E-3
LINE E-5
LINE E-4
LINE E-2
LINE E-1
LINE E
LINE M-1
LINE M
LINE N
LINE D
LINE D-1
MURRIETA VALLEY
Mesa de Burro
LINE P
WARM SPRINGS CHANNEL
WARM SPRINGS VALLEY
Temecula Hot Springs
APPROX. PROJECT LOCATION
MURRIETA CREEK CHANNEL
TEMECULA VALLEY
SANTA GERTRUDIS VALLEY
SANTA GERTRUDIS CHANNEL
WINCHESTER RD
LINE C-1
LINE C
SUB WATERSHED BOUNDARY (TYPICAL)
LINE A
Rancho California Airport
Rancho California
Long Canyon
FEE BOUNDARY
I-15
I-215
Temecula
SCALE: 1" = 1000'
AMEND NO. | TOTAL PLAN COST | DATE ADOPTED
— | $51,207,000 | MAR. 1986
1 | 88,297,000 | JAN. 1990
2 | 103,780,099 | JUNE 1993
NOTE: INDIVIDUAL FACILITY COSTS SHOWN ON THIS MAP HAVE BEEN UPDATED, REFER TO AMENDMENT #2
LEGEND
FEE BOUNDARY
CONC. LINED TRAP. CHAN. (1.5:1 UNLESS NOTED).
CONCRETE SIDES, EARTH BOTTOM TRAP. CHANNEL 1.5:1 UNLESS NOTED OTHERWISE.
PROPOSED STORM DRAINS
EXISTING FACILITIES
TYPICAL PIPE DIAMETER IN INCHES 10 YR. FLOW RATE IN CUBIC FEET PER SECOND (250 = 100 YR. FLOW RATE)
TO BE BUILT BY DEVELOPERS OR OTHERS (UNDER 36"Ø)
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
MURRIETA CREEK AREA DRAINAGE PLAN
MAR. 1986 SHT 2 OF 2
7A0880b

NOAA Atlas 14, Volume 6, Version 2
Location name: Murrieta, California, USA*
Latitude: 33.5432°, Longitude: -117.1844°
Elevation: 1103.95 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	1.42 (1.19-1.70)	1.86 (1.56-2.24)	2.48 (2.08-3.00)	3.01 (2.50-3.67)	3.76 (3.00-4.74)	4.36 (3.41-5.63)	4.98 (3.80-6.61)	5.66 (4.19-7.73)	6.61 (4.68-9.43)	7.38 (5.04-10.9)
10-min	1.01 (0.852-1.22)	1.34 (1.12-1.61)	1.78 (1.49-2.15)	2.15 (1.79-2.63)	2.69 (2.15-3.40)	3.12 (2.44-4.03)	3.58 (2.72-4.73)	4.06 (3.00-5.54)	4.74 (3.35-6.76)	5.29 (3.61-7.83)
15-min	0.816 (0.688-0.984)	1.08 (0.904-1.30)	1.44 (1.20-1.74)	1.74 (1.44-2.12)	2.17 (1.74-2.74)	2.52 (1.97-3.25)	2.88 (2.20-3.82)	3.27 (2.42-4.46)	3.82 (2.70-5.45)	4.27 (2.91-6.31)
30-min	0.630 (0.530-0.758)	0.832 (0.698-1.00)	1.11 (0.926-1.34)	1.34 (1.11-1.64)	1.67 (1.34-2.11)	1.94 (1.52-2.51)	2.22 (1.69-2.95)	2.52 (1.87-3.45)	2.95 (2.09-4.21)	3.29 (2.25-4.87)
60-min	0.482 (0.405-0.580)	0.636 (0.533-0.766)	0.846 (0.708-1.02)	1.02 (0.850-1.25)	1.28 (1.02-1.62)	1.48 (1.16-1.92)	1.70 (1.30-2.25)	1.93 (1.43-2.63)	2.25 (1.60-3.22)	2.52 (1.72-3.72)
2-hr	0.350 (0.294-0.422)	0.460 (0.386-0.554)	0.608 (0.508-0.735)	0.732 (0.607-0.892)	0.905 (0.724-1.14)	1.04 (0.815-1.35)	1.18 (0.902-1.57)	1.33 (0.987-1.82)	1.54 (1.09-2.20)	1.71 (1.17-2.53)
3-hr	0.289 (0.243-0.348)	0.379 (0.318-0.457)	0.500 (0.418-0.604)	0.600 (0.497-0.731)	0.739 (0.591-0.933)	0.848 (0.664-1.10)	0.961 (0.733-1.27)	1.08 (0.799-1.48)	1.24 (0.880-1.78)	1.37 (0.937-2.03)
6-hr	0.208 (0.174-0.250)	0.272 (0.228-0.328)	0.358 (0.300-0.433)	0.429 (0.356-0.523)	0.527 (0.421-0.665)	0.603 (0.472-0.779)	0.681 (0.519-0.903)	0.762 (0.564-1.04)	0.874 (0.619-1.25)	0.962 (0.656-1.42)
12-hr	0.138 (0.115-0.166)	0.181 (0.152-0.218)	0.238 (0.199-0.288)	0.285 (0.236-0.347)	0.349 (0.279-0.441)	0.399 (0.312-0.516)	0.450 (0.343-0.597)	0.503 (0.372-0.686)	0.575 (0.407-0.820)	0.631 (0.431-0.934)
24-hr	0.089 (0.079-0.103)	0.118 (0.104-0.137)	0.157 (0.138-0.182)	0.189 (0.165-0.220)	0.232 (0.196-0.280)	0.266 (0.220-0.327)	0.300 (0.243-0.378)	0.336 (0.265-0.435)	0.385 (0.292-0.518)	0.423 (0.310-0.589)
2-day	0.053 (0.047-0.061)	0.072 (0.064-0.083)	0.098 (0.086-0.113)	0.119 (0.104-0.139)	0.150 (0.127-0.180)	0.173 (0.144-0.213)	0.198 (0.161-0.250)	0.225 (0.177-0.291)	0.262 (0.199-0.353)	0.292 (0.214-0.406)
3-day	0.037 (0.033-0.043)	0.051 (0.045-0.059)	0.071 (0.062-0.082)	0.087 (0.076-0.102)	0.111 (0.094-0.134)	0.130 (0.108-0.160)	0.151 (0.122-0.190)	0.173 (0.136-0.223)	0.204 (0.155-0.274)	0.230 (0.168-0.319)
4-day	0.030 (0.027-0.035)	0.042 (0.037-0.049)	0.059 (0.052-0.068)	0.073 (0.064-0.085)	0.093 (0.079-0.112)	0.110 (0.091-0.135)	0.128 (0.103-0.161)	0.147 (0.116-0.190)	0.175 (0.133-0.236)	0.198 (0.145-0.276)
7-day	0.020 (0.018-0.023)	0.028 (0.025-0.033)	0.039 (0.035-0.046)	0.049 (0.043-0.058)	0.063 (0.054-0.077)	0.075 (0.062-0.092)	0.088 (0.071-0.110)	0.101 (0.080-0.131)	0.121 (0.092-0.163)	0.138 (0.101-0.192)
10-day	0.015 (0.013-0.018)	0.021 (0.019-0.025)	0.030 (0.027-0.035)	0.038 (0.033-0.044)	0.049 (0.041-0.059)	0.058 (0.048-0.071)	0.068 (0.055-0.085)	0.078 (0.062-0.101)	0.094 (0.071-0.126)	0.107 (0.078-0.149)
20-day	0.009 (0.008-0.011)	0.013 (0.012-0.016)	0.019 (0.017-0.022)	0.024 (0.021-0.028)	0.032 (0.027-0.038)	0.038 (0.031-0.046)	0.044 (0.036-0.056)	0.051 (0.041-0.066)	0.062 (0.047-0.083)	0.071 (0.052-0.099)
30-day	0.007 (0.007-0.009)	0.011 (0.009-0.012)	0.015 (0.014-0.018)	0.019 (0.017-0.023)	0.025 (0.021-0.031)	0.030 (0.025-0.037)	0.036 (0.029-0.045)	0.042 (0.033-0.054)	0.050 (0.038-0.068)	0.058 (0.042-0.080)
45-day	0.006 (0.005-0.007)	0.008 (0.007-0.010)	0.012 (0.011-0.014)	0.015 (0.013-0.018)	0.020 (0.017-0.024)	0.024 (0.020-0.029)	0.028 (0.023-0.036)	0.033 (0.026-0.043)	0.040 (0.030-0.054)	0.046 (0.034-0.064)
60-day	0.005 (0.004-0.006)	0.007 (0.006-0.008)	0.010 (0.009-0.012)	0.013 (0.012-0.015)	0.017 (0.015-0.021)	0.021 (0.017-0.025)	0.024 (0.020-0.031)	0.029 (0.022-0.037)	0.035 (0.026-0.046)	0.040 (0.029-0.055)

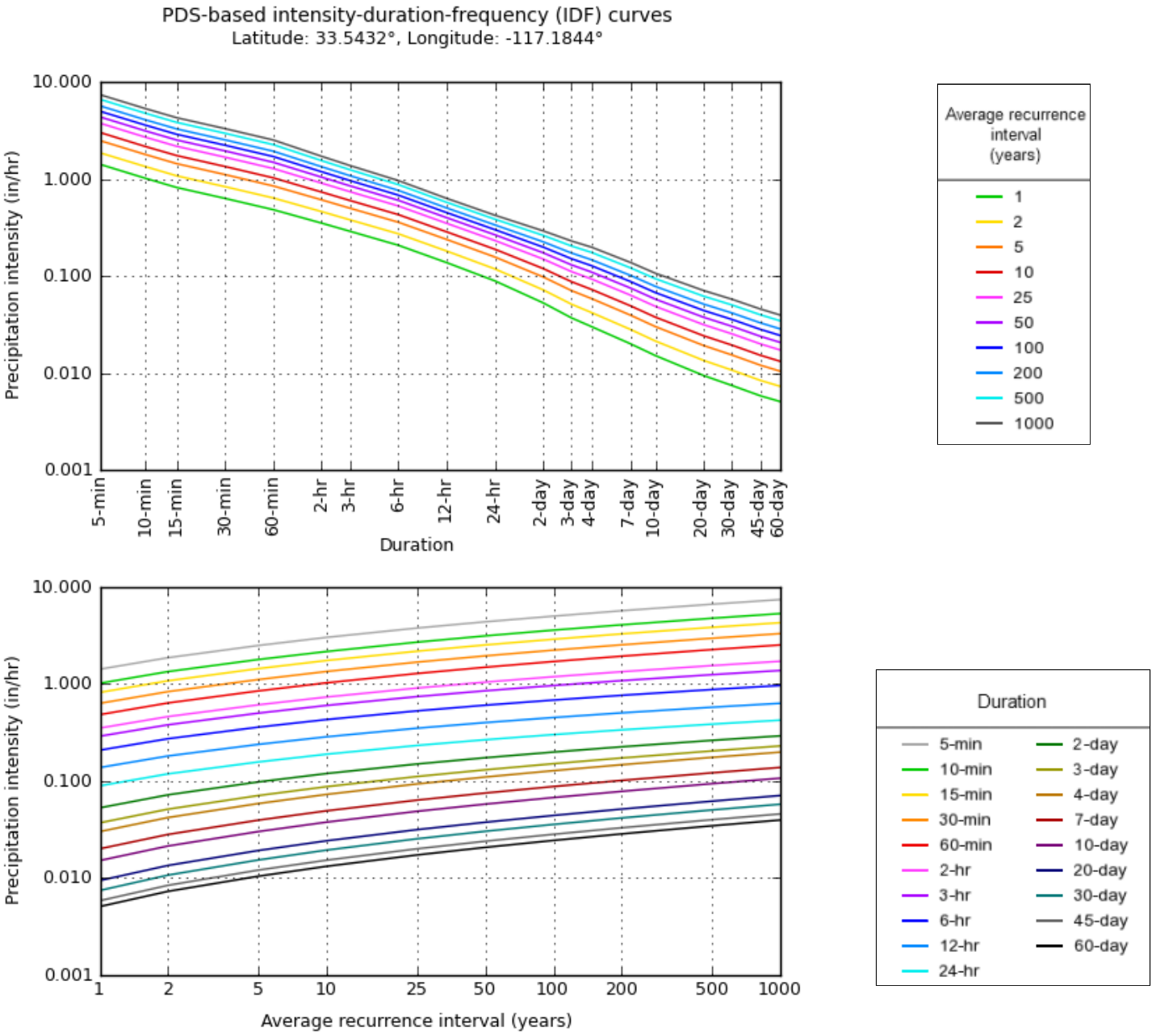
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at low er and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) w ill be greater than the upper bound (or less than the low er bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical



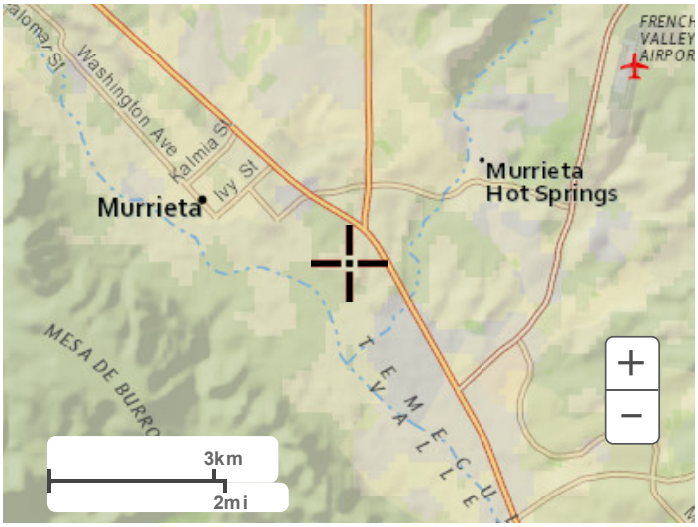
NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Wed May 16 17:58:07 2018

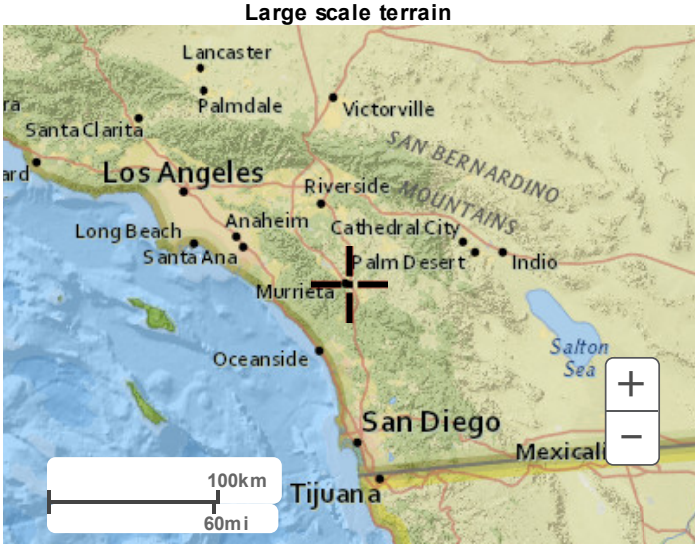
Back to Top

Maps & aerials

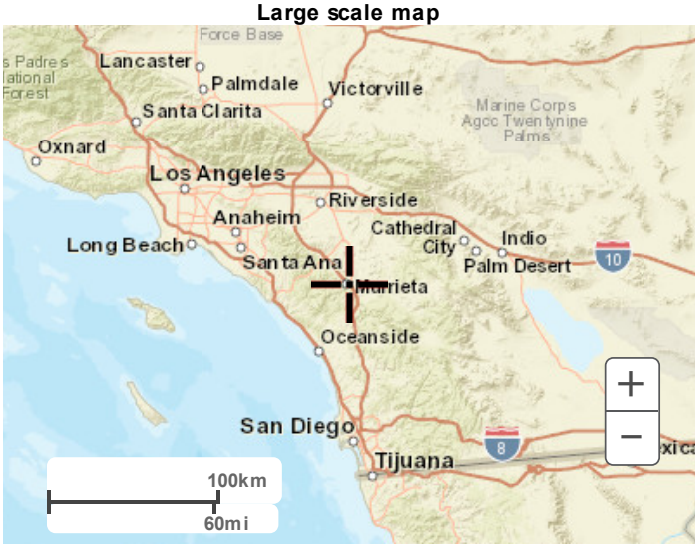
Small scale terrain



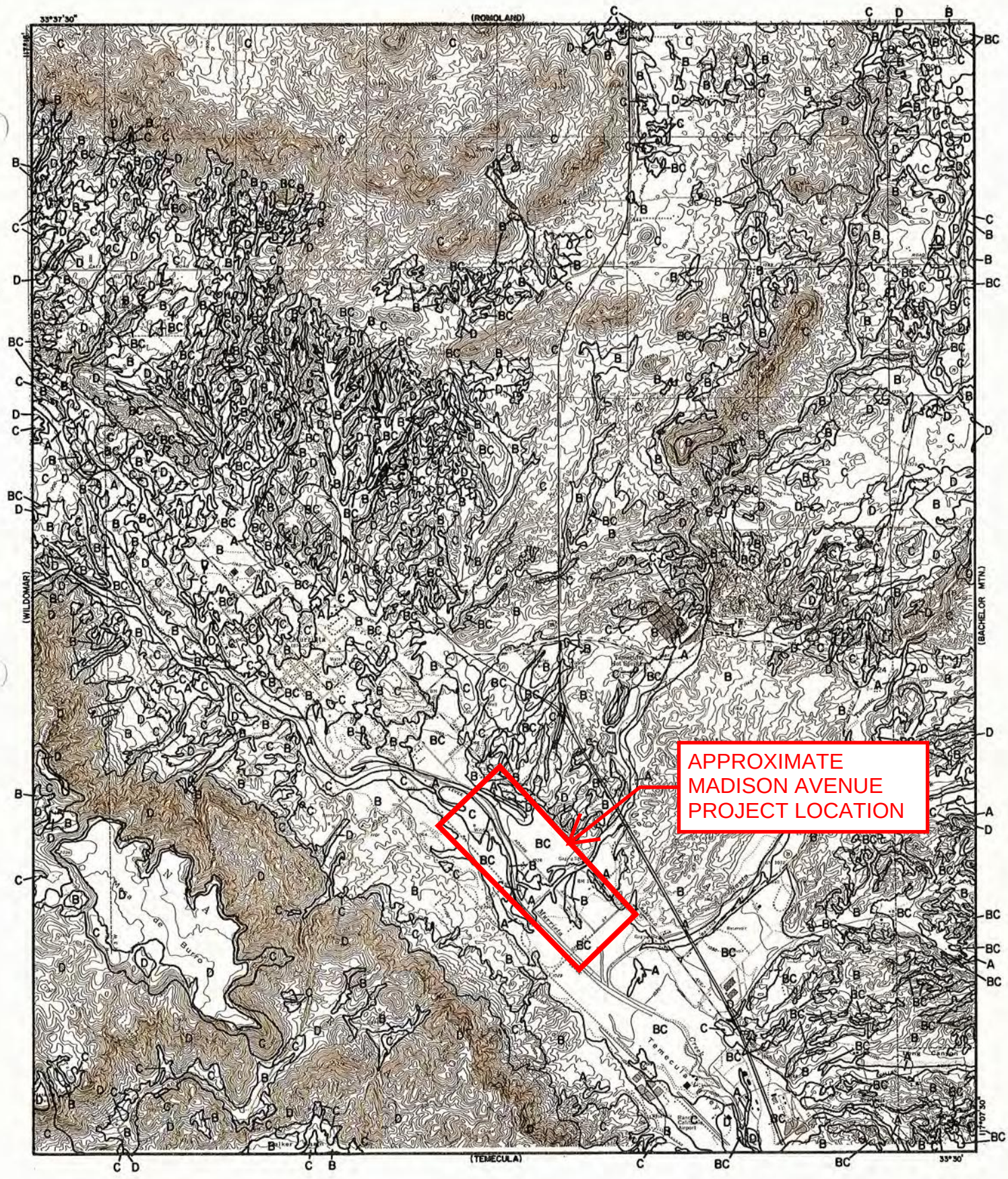
Large scale terrain



Large scale map



Large scale aerial



LEGEND

—— SOILS GROUP BOUNDARY

A SOILS GROUP DESIGNATION

RCFC&WCD

HYDROLOGY MANUAL

N

0 FEET 5000

HYDROLOGIC SOILS GROUP MAP FOR MURRIETA

PLATE C-1.52

RUNOFF INDEX NUMBERS OF HYDROLOGIC SOIL-COVER COMPLEXES FOR PERVIOUS AREAS-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
NATURAL COVERS -					
Barren (Rockland, eroded and graded land)		78	86	91	93
Chaparrel, Broadleaf (Manzonita, ceanothus and scrub oak)	Poor	53	70	80	85
	Fair	40	63	75	81
	Good	31	57	71	78
Chaparrel, Narrowleaf (Chamise and redshank)	Poor	71	82	88	91
	Fair	55	72	81	86
Grass, Annual or Perennial	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Meadows or Cienegas (Areas with seasonally high water table, principal vegetation is sod forming grass)	Poor	63	77	85	88
	Fair	51	70	80	84
	Good	30	58	72	78
Open Brush (Soft wood shrubs - buckwheat, sage, etc.)	Poor	62	76	84	88
	Fair	46	66	77	83
	Good	41	63	75	81
Woodland (Coniferous or broadleaf trees predominate. Canopy density is at least 50 percent)	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	28	55	70	77
Woodland, Grass (Coniferous or broadleaf trees with canopy density from 20 to 50 percent)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
URBAN COVERS -					
Residential or Commercial Landscaping (Lawn, shrubs, etc.)	Good	32	56	69	75
Turf (Irrigated and mowed grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
AGRICULTURAL COVERS -					
Fallow (Land plowed but not tilled or seeded)		76	85	90	92

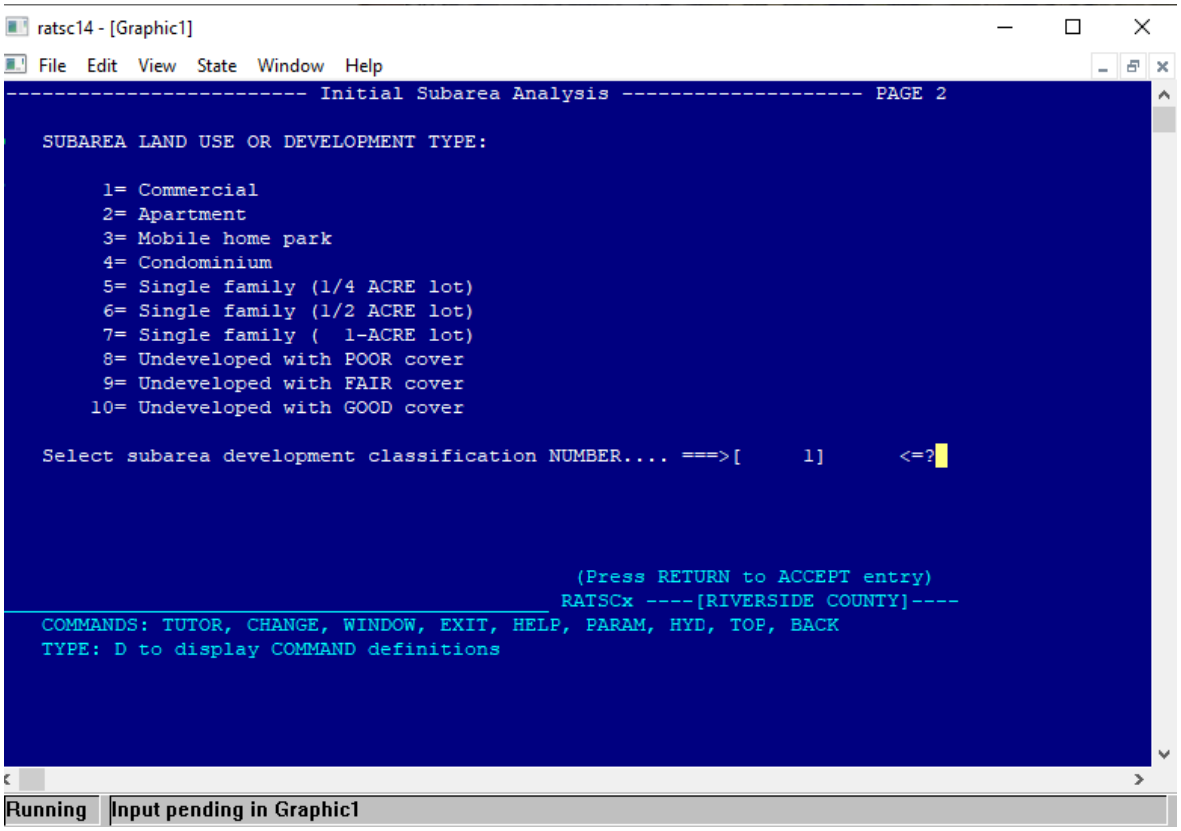
RCFC & WCD
HYDROLOGY MANUAL

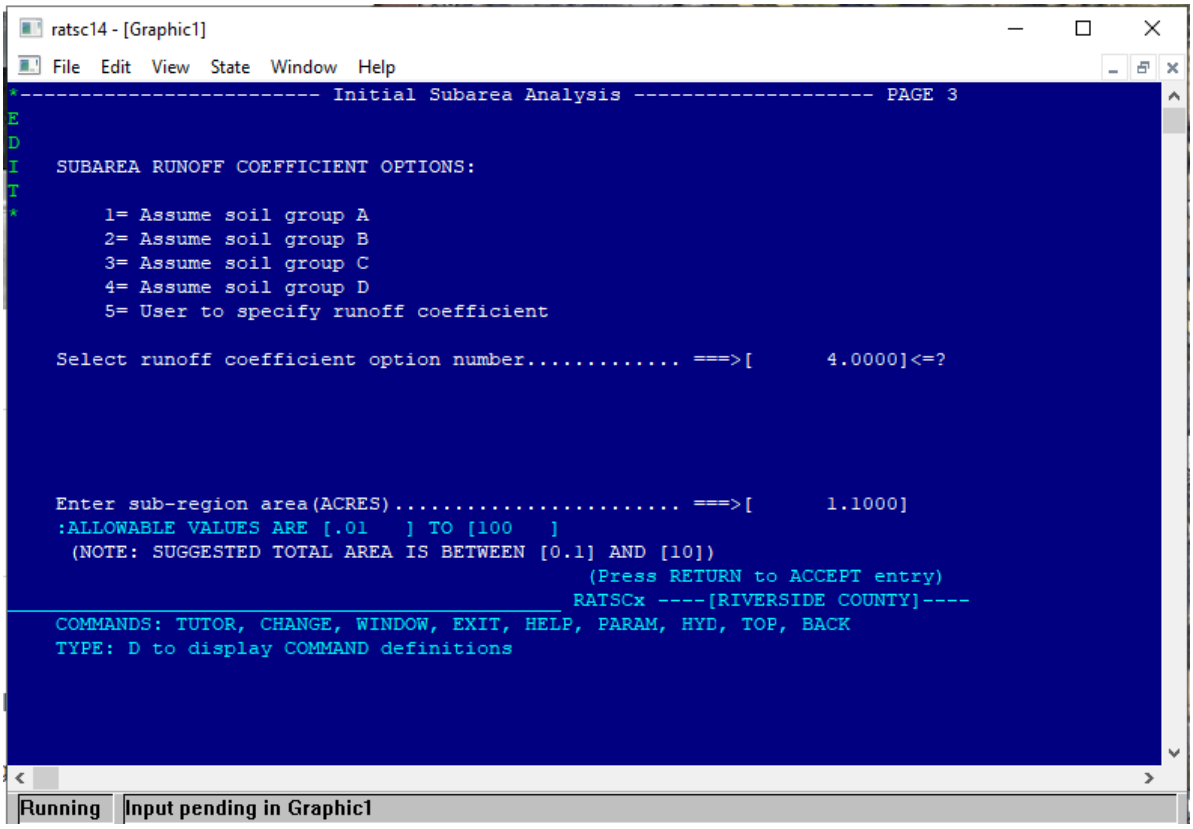
RUNOFF INDEX NUMBERS FOR PERVIOUS AREA

Note: Please refer to following page for example of typical AES entry parameters to calculate C value

PLATE D-5.5 (1 of 2)

Typical AES Entry Parameters for Software to Calculate C values
(Refer to Plate D-5.6 of RCFC Hydrology Manual for Land Use Description)





Murrieta Zoning Map

Adopted: June 17, 2014
Amended: xxxxxx xx, xxxx

Murrieta
the future of southern california

ZONING LEGEND

RESIDENTIAL

- RURAL RESIDENTIAL (RR) — BASE DENSITY 0-0.4 du/ac; MIN. LOT SIZE 2.5 ac
- ESTATE RESIDENTIAL 1 (ER-1) — BASE DENSITY 0.5-1.0 du/ac; MIN. LOT SIZE 1 ac
- ESTATE RESIDENTIAL 2 (ER-2) — BASE DENSITY 1.1-2.0 du/ac; MIN. LOT SIZE .5 ac
- ESTATE RESIDENTIAL 3 (ER-3) — BASE DENSITY 2.0-3.0 du/ac; MIN. LOT SIZE 10,000 s.f.
- SINGLE-FAMILY 1, RESIDENTIAL (SF-1) — BASE DENSITY 2.1-5.0 du/ac; MIN. LOT SIZE 3.5 du/ac - 7,200 s.f.
- SINGLE-FAMILY 2, RESIDENTIAL (SF-2) — BASE DENSITY 5.1-10.0 du/ac; MIN. LOT SIZE 5,000 s.f.
- MULTI-FAMILY 1, RESIDENTIAL (MF-1) — BASE DENSITY 10.1-15.0 du/ac; MIN. LOT SIZE 5 acres
- MULTI-FAMILY 2, RESIDENTIAL (MF-2) — BASE DENSITY 15.1-18.0 du/ac; MIN. LOT SIZE 5 acres
- MULTI-FAMILY 3, RESIDENTIAL (MF-3) — BASE DENSITY 30 du/ac; MIN. LOT SIZE 5 acres

COMMERCIAL

- NEIGHBORHOOD COMMERCIAL (NC)
- COMMUNITY COMMERCIAL (CC)
- REGIONAL COMMERCIAL (RC)

OFFICE

- OFFICE (O)
- OFFICE RESEARCH PARK (ORP)

BUSINESS PARK

- BUSINESS PARK (BP)

INDUSTRIAL

- GENERAL INDUSTRIAL (GI)
- GENERAL INDUSTRIAL - A (GIA)

INSTITUTIONAL

- CIVIC/INSTITUTIONAL (C/I)

PARKS AND OPEN SPACE

- PARKS & RECREATION (PR)
- OPEN SPACE (OS)

ADDITIONAL FEATURES LEGEND

- Specific Plan Boundary
- City Limits
- Sphere of Influence Boundary
- Creeks
- Transit Oriented Development Overlay

SURROUNDING MUNICIPALITIES

CITYNAME

- Menifee
- Temecula
- Wildomar
- Riverside County



This map is a public resource of general information. The feature data provided on this map represents the most accurate zoning and parcel information available at the most recent date of revision. In the event of a conflict between the zoning information on this map and an adopted City Resolution or ordinance, the Resolution or ordinance shall govern. The City of Murrieta and Riverside County makes no warranty, representation or guaranty as to the content, accuracy, or completeness of any information provided herein. City of Murrieta shall assume no liability for any errors, omissions, or inaccuracies in the information provided and is not responsible for any claims, losses or damages resulting from the use of map.

G:\GISData\Departments\Planning\ArcMapDocs_14\New_Zoning2014_FINAL.mxd

Menifee

Riverside County

Wildomar

Riverside County

Temecula

MAKENA MURRIETA SITE
AND APPROX. CONTRIBUTING DRAINAGE

SP 310

SP 276

Murrieta Springs SP 309

N
W E
S

1 0.5 0 1 Miles

Amendments

Date	Ordinance No.
7/14	493-14

Specific Plans Legend

Copper Canyon Specific Plan-SP 9
- Parks & Recreation
- Open Space
- Single-Family 1, Residential
- Single-Family 2, Residential
- Civic/Institutional

Creekside Specific Plan-SP 15
- Civic/Institutional
- Multi-Family 2
- Open Space
- Single-Family 2, Residential

Golden City Specific Plan - SP 5
- Civic/Institutional
- Multiple Use 2
- Open Space - AR
- Open Space - NR
- Open Space - SU
- Professional Office Park
- Residential - RS-6
- Residential - RS-7
- Residential - RS-7.5
- Residential - RS-8

Greer Ranch Specific Plan-SP 2
- Community Center
- Estate Residential
- Neighborhood Park
- Open Space
- Single Family Residential

Historic Murrieta Specific Plan-SP 8
- Village Mixed Use
- Village Multi-Family-1
- Village Multi-Family-3
- Village Neighborhood Commercial
- Village Public/Civic/Institutional
- Village Residential Office
- Village Rural Residential
- Village Single Family-1
- Village Single Family-2

Murrieta Highlands Specific Plan-SP 1
- Parks & Recreation
- Open Space
- Single-Family 1, Residential
- Single-Family 2, Residential
- Multi-Family 2, Residential
- Multiple Use, Area 2
- Civic/Institutional

Murrieta Oaks Specific Plan-SP 10
- Civic/Institutional
- Open Space
- Park
- Single-Family 1, Residential

Murrieta Springs Specific Plan-SP 309
- Civic/Institutional
- Community Commercial
- Open Space
- Parks
- Single-Family 1, Residential

Plaza de Murrieta Specific Plan-SP 20
- Single Family Detached Residential - PA-1
- Townhome 1 Residential - PA-2
- Townhome 2 Live/Work Residential - PA-3
- Village Commercial - PA-4
- Open Space - PA-5

SP 276 Specific Plan
- SP 276 Specific Plan

Vineyard Specific Plan-SP 215
- Commercial
- Open Space
- Park
- Residential
- School

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 11. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from U.S. Geological Survey Digital Orthophoto Quadrangles produced at a scale of 1:12,000 from photography dated 1994 or later.

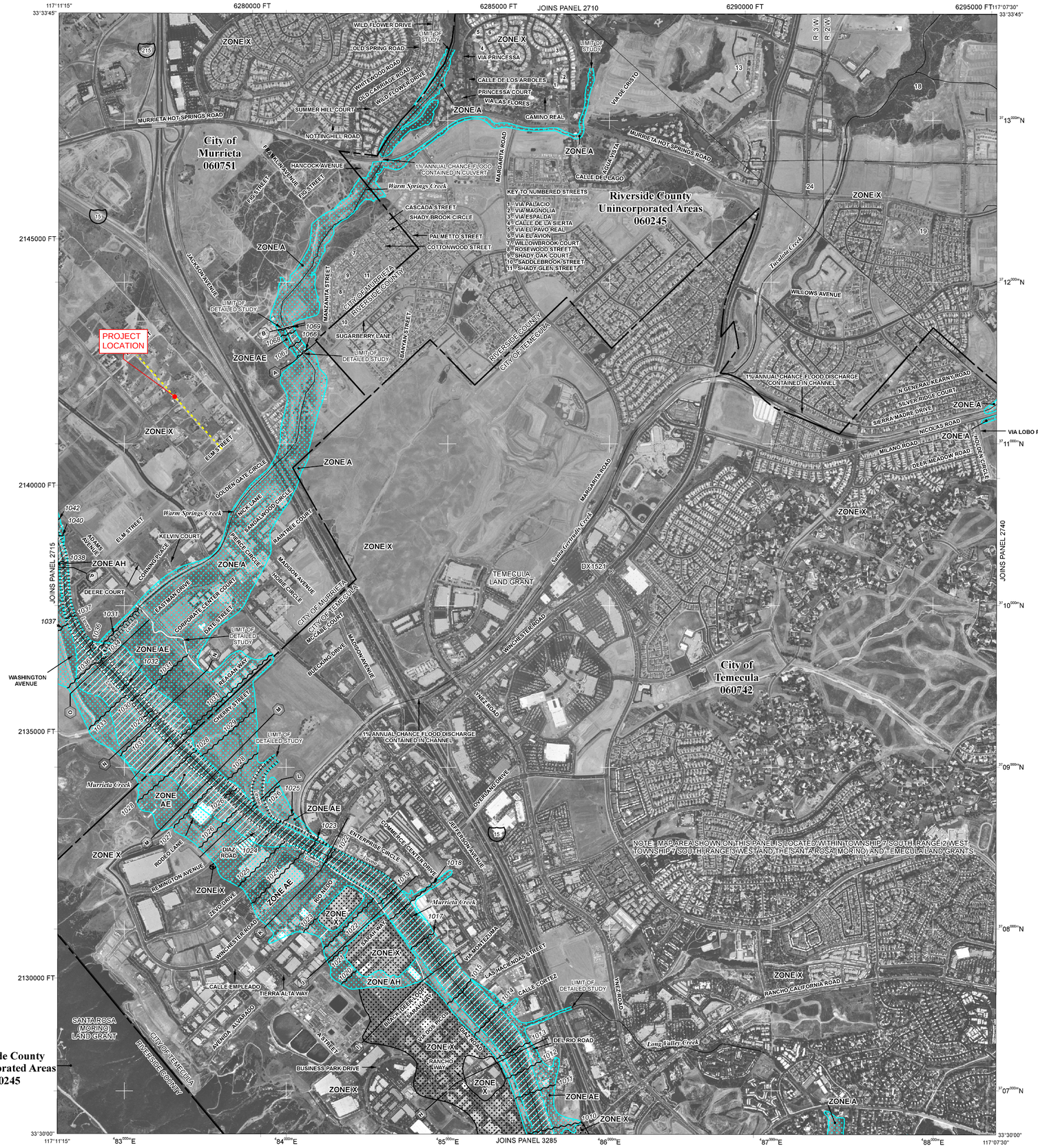
This map may reflect more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

- A — A — Cross section line
- 23 — 23 — Transect line
- 87°07'45", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 2776000mN — 1000-meter Universal Transverse Mercator grid values, zone 11N
- 600000 FT — 5000-foot grid ticks: California State Plane coordinate system, zone VI (FIPSZONE 0406), Lambert Conformal Conic projection
- DX5510 × — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- ●M1.5 — River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
August 28, 2008

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2720G

FIRM

FLOOD INSURANCE RATE MAP

RIVERSIDE COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 2720 OF 3805
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MURRIETA, CITY OF	060751	2720	G
RIVERSIDE COUNTY	060245	2720	G
TEMECULA, CITY OF	060742	2720	G

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
06065C2720G

EFFECTIVE DATE
AUGUST 28, 2008

Federal Emergency Management Agency

Appendix B

Off-site AES Output

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2014 Advanced Engineering Software (aes)
                    (Rational Tabling Version 21.0)
                Release Date: 06/01/2014  License ID 1261

                          Analysis prepared by:

                         RICK ENGINEERING COMPANY
                             5620 Friars Road
                          San Diego, California 92110
                        619-291-0707   Fax 619-291-4165

 ************************* DESCRIPTION OF STUDY *************************
* MADISON AVE STREET IMPROVEMENTS, J-18099                              *
* ULTIMATE BUILD OUT CONDITION 100-YR, BASIN 100                        *
* w:\18099\WaterResources\Hydrology\RationalMethod\...                  *
 ************************************************************************

  FILE NAME: MA100U00.RAT
  TIME/DATE OF STUDY: 11:10 07/23/2018
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.360
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.880
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.480
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.300
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.5505732
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.5495536
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.300
  SLOPE OF INTENSITY DURATION CURVE = 0.5496
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```

```
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

+---------------------------------------------------------------------------+
| ULTIMATE BUILD OUT CONDITIONS ARE BEING MODELED BASED ON THE CITY OF      |
| MURRIETA'S GENERAL PLAN 2035 LAND USE MAP                                 |
|                                                                           |
+---------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    91.00
  UPSTREAM ELEVATION(FEET) =   1196.00
  DOWNSTREAM ELEVATION(FEET) =   1195.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  TC = 0.303*[(   91.00**3)/(     1.00)]**.2 =    4.540
  COMPUTED TIME OF CONCENTRATION INCREASED TO 5 MIN.
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.093
  USER-SPECIFIED RUNOFF COEFFICIENT = .8905
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.91
  TOTAL AREA(ACRES) =      0.20   TOTAL RUNOFF(CFS) =      0.91

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    105.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1195.00  DOWNSTREAM ELEVATION(FEET) = 1174.00
  STREET LENGTH(FEET) =  1403.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 45.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  40.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200
```

```
    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.73
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.35
    HALFSTREET FLOOD WIDTH(FEET) =   11.99
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.38
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.82
  STREET FLOW TRAVEL TIME(MIN.) =   9.83   Tc(MIN.) =   14.83
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.802
  USER-SPECIFIED RUNOFF COEFFICIENT = .8841
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    4.50      SUBAREA RUNOFF(CFS) =   11.15
  TOTAL AREA(ACRES) =        4.7        PEAK FLOW RATE(CFS) =      12.06

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.40   HALFSTREET FLOOD WIDTH(FEET) =  15.20
  FLOW VELOCITY(FEET/SEC.) =  2.74   DEPTH*VELOCITY(FT*FT/SEC.) =   1.10
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =    1494.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.802
  USER-SPECIFIED RUNOFF COEFFICIENT = .8841
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    8.30   SUBAREA RUNOFF(CFS) =   20.56
  TOTAL AREA(ACRES) =       13.0   TOTAL RUNOFF(CFS) =      32.62
  TC(MIN.) =   14.83

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    109.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1171.00  DOWNSTREAM(FEET) =  1164.00
  FLOW LENGTH(FEET) =   334.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  17.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.79
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      32.62
  PIPE TRAVEL TIME(MIN.) =   0.47    Tc(MIN.) =   15.30
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    109.00 =    1828.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    109.00 TO NODE    110.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1164.00  DOWNSTREAM(FEET) =  1124.00
  FLOW LENGTH(FEET) =  1012.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.98
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      32.62
  PIPE TRAVEL TIME(MIN.) =   1.13    Tc(MIN.) =   16.43
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    110.00 =    2840.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.649
  USER-SPECIFIED RUNOFF COEFFICIENT = .8170
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    3.80   SUBAREA RUNOFF(CFS) =    8.22
  TOTAL AREA(ACRES) =       16.8   TOTAL RUNOFF(CFS) =      40.84
  TC(MIN.) =   16.43

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    115.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1121.00  DOWNSTREAM(FEET) =  1120.00
  FLOW LENGTH(FEET) =   254.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  39.0 INCH PIPE IS  27.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.63
  ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      40.84
  PIPE TRAVEL TIME(MIN.) =   0.64    Tc(MIN.) =   17.07
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    115.00 =    3094.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    115.00 TO NODE    115.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   17.07
  RAINFALL INTENSITY(INCH/HR) =   2.59
  TOTAL STREAM AREA(ACRES) =    16.80
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     40.84
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    92.00
  UPSTREAM ELEVATION(FEET) =   1173.00
  DOWNSTREAM ELEVATION(FEET) =   1170.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  TC = 0.303*[(   92.00**3)/(     3.00)]**.2 =    3.668
  COMPUTED TIME OF CONCENTRATION INCREASED TO 5 MIN.
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.093
  USER-SPECIFIED RUNOFF COEFFICIENT = .8905
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.91
  TOTAL AREA(ACRES) =      0.20   TOTAL RUNOFF(CFS) =      0.91

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    113.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1170.00  DOWNSTREAM(FEET) =   1154.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   679.00   CHANNEL SLOPE =  0.0236
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.866
  USER-SPECIFIED RUNOFF COEFFICIENT = .8577
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      13.77
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.47
  AVERAGE FLOW DEPTH(FEET) =   0.35   TRAVEL TIME(MIN.) =   3.26
  Tc(MIN.) =    8.26
  SUBAREA AREA(ACRES) =     7.60       SUBAREA RUNOFF(CFS) =   25.20
  TOTAL AREA(ACRES) =        7.8         PEAK FLOW RATE(CFS) =      26.11

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.51   FLOW VELOCITY(FEET/SEC.) =   4.29
  LONGEST FLOWPATH FROM NODE    111.00 TO NODE    113.00 =     771.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    113.00 TO NODE    115.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
```

```
 ELEVATION DATA: UPSTREAM(FEET) =   1154.00  DOWNSTREAM(FEET) =   1127.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =  1358.00   CHANNEL SLOPE =  0.0199
 CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.038
 USER-SPECIFIED RUNOFF COEFFICIENT = .8259
 SOIL CLASSIFICATION IS "C"
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      48.78
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.98
 AVERAGE FLOW DEPTH(FEET) =   0.75   TRAVEL TIME(MIN.) =   4.54
 Tc(MIN.) =   12.80
 SUBAREA AREA(ACRES) =    17.90       SUBAREA RUNOFF(CFS) =   44.92
 TOTAL AREA(ACRES) =       25.7         PEAK FLOW RATE(CFS) =      71.02

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.93   FLOW VELOCITY(FEET/SEC.) =   5.60
 LONGEST FLOWPATH FROM NODE    111.00 TO NODE    115.00 =    2129.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    115.00 TO NODE    115.00 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.) =   12.80
 RAINFALL INTENSITY(INCH/HR) =   3.04
 TOTAL STREAM AREA(ACRES) =    25.70
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     71.02

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       40.84    17.07        2.594         16.80
     2       71.02    12.80        3.038         25.70

***********************************WARNING**********************************
 IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
 ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
 WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
****************************************************************************

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

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1      101.65    12.80       3.038
```

```
      2      101.48    17.07       2.594

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     101.65   Tc(MIN.) =   12.80
  TOTAL AREA(ACRES) =       42.5
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    115.00 =    3094.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    115.00 TO NODE    117.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1120.00  DOWNSTREAM(FEET) =  1118.00
  FLOW LENGTH(FEET) =   279.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  48.0 INCH PIPE IS  34.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.37
  ESTIMATED PIPE DIAMETER(INCH) =  48.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     101.65
  PIPE TRAVEL TIME(MIN.) =   0.45    Tc(MIN.) =   13.25
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    117.00 =    3373.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    117.00 TO NODE    125.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1118.00  DOWNSTREAM(FEET) =   1115.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   142.00   CHANNEL SLOPE =  0.0211
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.936
  USER-SPECIFIED RUNOFF COEFFICIENT = .7475
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     101.98
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.37
  AVERAGE FLOW DEPTH(FEET) =   1.11   TRAVEL TIME(MIN.) =   0.37
  Tc(MIN.) =   13.62
  SUBAREA AREA(ACRES) =     0.30       SUBAREA RUNOFF(CFS) =    0.66
  TOTAL AREA(ACRES) =       42.8         PEAK FLOW RATE(CFS) =     102.31

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.11   FLOW VELOCITY(FEET/SEC.) =   6.39
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    125.00 =    3515.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    125.00 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.) =   13.62
  RAINFALL INTENSITY(INCH/HR) =   2.94
  TOTAL STREAM AREA(ACRES) =    42.80
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    102.31

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    122.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    81.00
  UPSTREAM ELEVATION(FEET) =   1170.00
  DOWNSTREAM ELEVATION(FEET) =   1161.00
  ELEVATION DIFFERENCE(FEET) =      9.00
  TC = 0.303*[(   81.00**3)/(     9.00)]**.2 =    2.728
  COMPUTED TIME OF CONCENTRATION INCREASED TO 5 MIN.
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.093
  USER-SPECIFIED RUNOFF COEFFICIENT = .8905
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.45
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.45

****************************************************************************
  FLOW PROCESS FROM NODE    122.00 TO NODE    123.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1161.00  DOWNSTREAM(FEET) =   1125.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   863.00   CHANNEL SLOPE =  0.0417
  CHANNEL BASE(FEET) =    6.00   "Z" FACTOR =   8.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.661
  USER-SPECIFIED RUNOFF COEFFICIENT = .7735
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.22
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.49
  AVERAGE FLOW DEPTH(FEET) =   0.26   TRAVEL TIME(MIN.) =   4.12
  Tc(MIN.) =    9.12
  SUBAREA AREA(ACRES) =     4.60       SUBAREA RUNOFF(CFS) =   13.03
  TOTAL AREA(ACRES) =        4.7         PEAK FLOW RATE(CFS) =      13.48

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.36   FLOW VELOCITY(FEET/SEC.) =   4.19
```

```
 LONGEST FLOWPATH FROM NODE    120.00 TO NODE    123.00 =     944.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    123.00 TO NODE    125.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   1125.00  DOWNSTREAM(FEET) =   1115.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   559.00   CHANNEL SLOPE =  0.0179
 CHANNEL BASE(FEET) =    6.00   "Z" FACTOR =   8.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.186
 USER-SPECIFIED RUNOFF COEFFICIENT = .8858
 SOIL CLASSIFICATION IS "C"
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      20.82
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.55
 AVERAGE FLOW DEPTH(FEET) =   0.56   TRAVEL TIME(MIN.) =   2.63
 Tc(MIN.) =   11.74
 SUBAREA AREA(ACRES) =     5.20       SUBAREA RUNOFF(CFS) =   14.67
 TOTAL AREA(ACRES) =        9.9         PEAK FLOW RATE(CFS) =      28.16

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.65   FLOW VELOCITY(FEET/SEC.) =   3.86
 LONGEST FLOWPATH FROM NODE    120.00 TO NODE    125.00 =    1503.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    125.00 TO NODE    125.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =   11.74
 RAINFALL INTENSITY(INCH/HR) =   3.19
 TOTAL STREAM AREA(ACRES) =     9.90
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     28.16

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1      102.31    13.62        2.936         42.80
     2       28.16    11.74        3.186          9.90

 ********************************WARNING*************************************
 IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
 ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
 WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ****************************************************************************
```

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1      116.35    11.74       3.186
      2      128.26    13.62       2.936

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     128.26   Tc(MIN.) =   13.62
  TOTAL AREA(ACRES) =       52.7
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    125.00 =    3515.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    127.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1115.00  DOWNSTREAM(FEET) =   1108.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   607.00   CHANNEL SLOPE =  0.0115
  CHANNEL BASE(FEET) =    8.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.709
  USER-SPECIFIED RUNOFF COEFFICIENT = .8837
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     139.51
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.70
  AVERAGE FLOW DEPTH(FEET) =   1.37   TRAVEL TIME(MIN.) =   2.15
  Tc(MIN.) =   15.77
  SUBAREA AREA(ACRES) =     9.40       SUBAREA RUNOFF(CFS) =   22.50
  TOTAL AREA(ACRES) =       62.1         PEAK FLOW RATE(CFS) =     150.76

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.41   FLOW VELOCITY(FEET/SEC.) =   4.81
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    127.00 =    4122.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    127.00 TO NODE    127.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.709
  USER-SPECIFIED RUNOFF COEFFICIENT = .8837
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =   12.70   SUBAREA RUNOFF(CFS) =   30.40
  TOTAL AREA(ACRES) =       74.8   TOTAL RUNOFF(CFS) =     181.17
  TC(MIN.) =   15.77
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    127.00 TO NODE    129.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1100.00  DOWNSTREAM(FEET) =  1094.00
  FLOW LENGTH(FEET) =   308.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  48.0 INCH PIPE IS  37.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.25
  ESTIMATED PIPE DIAMETER(INCH) =  48.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     181.17
  PIPE TRAVEL TIME(MIN.) =   0.30    Tc(MIN.) =   16.07
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    129.00 =    4430.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    129.00 TO NODE    160.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1094.00  DOWNSTREAM(FEET) =   1086.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1226.00   CHANNEL SLOPE =  0.0065
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.369
  USER-SPECIFIED RUNOFF COEFFICIENT = .8818
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     193.81
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.03
  AVERAGE FLOW DEPTH(FEET) =   2.10   TRAVEL TIME(MIN.) =   4.06
  Tc(MIN.) =   20.13
  SUBAREA AREA(ACRES) =    12.10       SUBAREA RUNOFF(CFS) =   25.28
  TOTAL AREA(ACRES) =       86.9         PEAK FLOW RATE(CFS) =     206.45

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  2.16   FLOW VELOCITY(FEET/SEC.) =   5.12
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    160.00 =    5656.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    132.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
==========================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =   1143.00
  DOWNSTREAM ELEVATION(FEET) =   1142.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  TC = 0.303*[(   75.00**3)/(     1.00)]**.2 =    4.042
  COMPUTED TIME OF CONCENTRATION INCREASED TO 5 MIN.
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.093
  USER-SPECIFIED RUNOFF COEFFICIENT = .8905
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.45
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.45

**************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    135.00 IS CODE =  51
--------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1142.00  DOWNSTREAM(FEET) =   1110.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   736.00   CHANNEL SLOPE =  0.0435
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.776
  USER-SPECIFIED RUNOFF COEFFICIENT = .8877
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.67
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.39
  AVERAGE FLOW DEPTH(FEET) =   0.21   TRAVEL TIME(MIN.) =   3.62
  Tc(MIN.) =    8.62
  SUBAREA AREA(ACRES) =     4.20       SUBAREA RUNOFF(CFS) =   14.08
  TOTAL AREA(ACRES) =        4.3         PEAK FLOW RATE(CFS) =      14.53

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.30   FLOW VELOCITY(FEET/SEC.) =   4.32
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    135.00 =     811.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE    135.00 TO NODE    135.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.776
  USER-SPECIFIED RUNOFF COEFFICIENT = .8877
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    6.90   SUBAREA RUNOFF(CFS) =   23.12
  TOTAL AREA(ACRES) =       11.2   TOTAL RUNOFF(CFS) =      37.65
```

```
  TC(MIN.) =    8.62

****************************************************************************
  FLOW PROCESS FROM NODE    135.00 TO NODE    137.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1107.00  DOWNSTREAM(FEET) =  1103.00
  FLOW LENGTH(FEET) =   176.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.52
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      37.65
  PIPE TRAVEL TIME(MIN.) =   0.23    Tc(MIN.) =    8.86
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    137.00 =     987.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    137.00 TO NODE    137.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.720
  USER-SPECIFIED RUNOFF COEFFICIENT = .8563
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    2.50   SUBAREA RUNOFF(CFS) =    7.96
  TOTAL AREA(ACRES) =       13.7   TOTAL RUNOFF(CFS) =      45.62
  TC(MIN.) =    8.86

****************************************************************************
  FLOW PROCESS FROM NODE    137.00 TO NODE    139.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1103.00  DOWNSTREAM(FEET) =  1099.00
  FLOW LENGTH(FEET) =   175.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  19.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.25
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      45.62
  PIPE TRAVEL TIME(MIN.) =   0.22    Tc(MIN.) =    9.08
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    139.00 =    1162.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    139.00 TO NODE    150.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =   1099.00  DOWNSTREAM(FEET) =   1094.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   613.00   CHANNEL SLOPE =  0.0082
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.182
  USER-SPECIFIED RUNOFF COEFFICIENT = .8857
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      54.79
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.79
  AVERAGE FLOW DEPTH(FEET) =   1.03   TRAVEL TIME(MIN.) =   2.70
  Tc(MIN.) =   11.77
  SUBAREA AREA(ACRES) =     6.50       SUBAREA RUNOFF(CFS) =   18.32
  TOTAL AREA(ACRES) =       20.2         PEAK FLOW RATE(CFS) =      63.94

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.11   FLOW VELOCITY(FEET/SEC.) =   3.98
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    150.00 =    1775.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    150.00 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.) =   11.77
  RAINFALL INTENSITY(INCH/HR) =   3.18
  TOTAL STREAM AREA(ACRES) =    20.20
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     63.94

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    142.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =   1155.00
  DOWNSTREAM ELEVATION(FEET) =   1138.00
  ELEVATION DIFFERENCE(FEET) =     17.00
  TC = 0.303*[(   75.00**3)/(    17.00)]**.2 =    2.294
  COMPUTED TIME OF CONCENTRATION INCREASED TO 5 MIN.
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.093
  USER-SPECIFIED RUNOFF COEFFICIENT = .8905
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.45
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.45
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    145.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1138.00  DOWNSTREAM(FEET) =   1126.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   209.00   CHANNEL SLOPE =  0.0574
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.373
  USER-SPECIFIED RUNOFF COEFFICIENT = .8892
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.82
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.18
  AVERAGE FLOW DEPTH(FEET) =   0.08   TRAVEL TIME(MIN.) =   1.60
  Tc(MIN.) =    6.60
  SUBAREA AREA(ACRES) =     0.70       SUBAREA RUNOFF(CFS) =    2.72
  TOTAL AREA(ACRES) =        0.8         PEAK FLOW RATE(CFS) =       3.18

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.11   FLOW VELOCITY(FEET/SEC.) =   2.72
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    145.00 =     284.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    145.00 TO NODE    147.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1123.00  DOWNSTREAM(FEET) =  1107.00
  FLOW LENGTH(FEET) =   296.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.19
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.18
  PIPE TRAVEL TIME(MIN.) =   0.54    Tc(MIN.) =    7.14
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    147.00 =     580.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    147.00 TO NODE    150.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1107.00  DOWNSTREAM(FEET) =   1094.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   315.00   CHANNEL SLOPE =  0.0413
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
```

```
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.726
 USER-SPECIFIED RUNOFF COEFFICIENT = .8875
 SOIL CLASSIFICATION IS "C"
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.99
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.10
 AVERAGE FLOW DEPTH(FEET) =   0.18   TRAVEL TIME(MIN.) =   1.69
 Tc(MIN.) =    8.83
 SUBAREA AREA(ACRES) =     1.70       SUBAREA RUNOFF(CFS) =    5.62
 TOTAL AREA(ACRES) =        2.5         PEAK FLOW RATE(CFS) =       8.80

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.23   FLOW VELOCITY(FEET/SEC.) =   3.57
 LONGEST FLOWPATH FROM NODE    140.00 TO NODE    150.00 =     895.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    150.00 TO NODE    150.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.83
 RAINFALL INTENSITY(INCH/HR) =   3.73
 TOTAL STREAM AREA(ACRES) =     2.50
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.80

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       63.94    11.77        3.182         20.20
     2        8.80     8.83        3.726          2.50

*********************************WARNING*********************************
 IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
 ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
 WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
*************************************************************************

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

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       56.76     8.83       3.726
     2       71.45    11.77       3.182

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      71.45   Tc(MIN.) =   11.77
```

```
  TOTAL AREA(ACRES) =       22.7
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    150.00 =    1775.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    160.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1094.00  DOWNSTREAM(FEET) =   1086.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   794.00   CHANNEL SLOPE =  0.0101
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.821
  USER-SPECIFIED RUNOFF COEFFICIENT = .8842
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      81.06
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.60
  AVERAGE FLOW DEPTH(FEET) =   1.19   TRAVEL TIME(MIN.) =   2.88
  Tc(MIN.) =   14.65
  SUBAREA AREA(ACRES) =     7.70       SUBAREA RUNOFF(CFS) =   19.21
  TOTAL AREA(ACRES) =       30.4         PEAK FLOW RATE(CFS) =      90.66

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.27   FLOW VELOCITY(FEET/SEC.) =   4.74
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    160.00 =    2569.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       90.66    14.65       2.821       30.40
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    160.00 =    2569.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1      206.45    20.13       2.369       86.90
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    160.00 =    5656.00 FEET.

 ****************************WARNING*********************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ********************************************************************
```

```
  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1     240.88      14.65        2.821
      2     282.57      20.13        2.369

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     282.57   Tc(MIN.) =   20.13
  TOTAL AREA(ACRES) =      117.3

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    165.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1086.00  DOWNSTREAM(FEET) =   1083.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   444.00   CHANNEL SLOPE =  0.0068
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.290
  USER-SPECIFIED RUNOFF COEFFICIENT = .8707
  SOIL CLASSIFICATION IS "D"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     301.21
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.74
  AVERAGE FLOW DEPTH(FEET) =   2.58   TRAVEL TIME(MIN.) =   1.29
  Tc(MIN.) =   21.42
  SUBAREA AREA(ACRES) =    18.70       SUBAREA RUNOFF(CFS) =   37.28
  TOTAL AREA(ACRES) =      136.0         PEAK FLOW RATE(CFS) =     319.85

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  2.66   FLOW VELOCITY(FEET/SEC.) =   5.83
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    165.00 =    6100.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    165.00 TO NODE    170.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1083.00  DOWNSTREAM(FEET) =   1078.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   810.00   CHANNEL SLOPE =  0.0062
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
```

```
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.162
  USER-SPECIFIED RUNOFF COEFFICIENT = .8693
  SOIL CLASSIFICATION IS "D"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     335.17
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.73
  AVERAGE FLOW DEPTH(FEET) =   2.77   TRAVEL TIME(MIN.) =   2.36
  Tc(MIN.) =   23.78
  SUBAREA AREA(ACRES) =    16.30       SUBAREA RUNOFF(CFS) =   30.63
  TOTAL AREA(ACRES) =      152.3         PEAK FLOW RATE(CFS) =     350.49

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  2.84   FLOW VELOCITY(FEET/SEC.) =   5.79
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    170.00 =    6910.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    170.00 TO NODE    170.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.162
  USER-SPECIFIED RUNOFF COEFFICIENT = .8693
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    5.20   SUBAREA RUNOFF(CFS) =    9.77
  TOTAL AREA(ACRES) =      157.5   TOTAL RUNOFF(CFS) =     360.26
  TC(MIN.) =   23.78
----------------------------------------------------------------------------
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =      157.5  TC(MIN.) =     23.78
  PEAK FLOW RATE(CFS)   =     360.26
----------------------------------------------------------------------------
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2014 Advanced Engineering Software (aes)
                    (Rational Tabling Version 21.0)
                Release Date: 06/01/2014  License ID 1261

                          Analysis prepared by:

                         RICK ENGINEERING COMPANY
                             5620 Friars Road
                          San Diego, California 92110
                        619-291-0707   Fax 619-291-4165

 ************************* DESCRIPTION OF STUDY *************************
* MADISON AVE STREET IMPROVEMENTS, J-18099                              *
* ULTIMATE BUILD OUT CONDITION 100-YR, BASIN 200                        *
* w:\18099\WaterResources\Hydrology\RationalMethod\...                  *
 ************************************************************************

  FILE NAME: MA200U00.RAT
  TIME/DATE OF STUDY: 11:17 07/23/2018
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.360
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.880
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.480
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.300
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.5505732
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.5495536
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.300
  SLOPE OF INTENSITY DURATION CURVE = 0.5496
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```

```
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

+---------------------------------------------------------------------------+
| ULITMATE BUILD OUT CONDITIONS ARE BEING MODELED BASED ON THE CITY OF      |
| MURRIETA'S GENERAL PLAN 2035 LAND USE MAP                                 |
|                                                                           |
+---------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY (1/4 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   1122.00
  DOWNSTREAM ELEVATION(FEET) =   1120.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  TC = 0.393*[(  100.00**3)/(     2.00)]**.2 =    5.417
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.874
  USER-SPECIFIED RUNOFF COEFFICIENT = .8507
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.83
  TOTAL AREA(ACRES) =      0.20   TOTAL RUNOFF(CFS) =      0.83

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    210.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1120.00  DOWNSTREAM(FEET) =   1118.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   500.00   CHANNEL SLOPE =  0.0040
  CHANNEL BASE(FEET) =    8.00   "Z" FACTOR =   6.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.241
  USER-SPECIFIED RUNOFF COEFFICIENT = .8298
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.13
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.40
  AVERAGE FLOW DEPTH(FEET) =   0.36   TRAVEL TIME(MIN.) =   5.97
  Tc(MIN.) =   11.39
  SUBAREA AREA(ACRES) =     3.10       SUBAREA RUNOFF(CFS) =    8.34
  TOTAL AREA(ACRES) =        3.3         PEAK FLOW RATE(CFS) =       9.17
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.50   FLOW VELOCITY(FEET/SEC.) =   1.67
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    210.00 =     600.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    220.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1113.00  DOWNSTREAM(FEET) =  1111.00
  FLOW LENGTH(FEET) =   126.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.76
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.17
  PIPE TRAVEL TIME(MIN.) =   0.27    Tc(MIN.) =   11.66
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    220.00 =     726.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    223.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1111.00  DOWNSTREAM(FEET) =   1103.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   656.00   CHANNEL SLOPE =  0.0122
  CHANNEL BASE(FEET) =    8.00   "Z" FACTOR =   6.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.763
  USER-SPECIFIED RUNOFF COEFFICIENT = .8840
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      18.58
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.07
  AVERAGE FLOW DEPTH(FEET) =   0.54   TRAVEL TIME(MIN.) =   3.56
  Tc(MIN.) =   15.22
  SUBAREA AREA(ACRES) =     7.70       SUBAREA RUNOFF(CFS) =   18.81
  TOTAL AREA(ACRES) =       11.0         PEAK FLOW RATE(CFS) =      27.97

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.67   FLOW VELOCITY(FEET/SEC.) =   3.44
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    223.00 =    1382.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    223.00 TO NODE    226.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
```

```
 ELEVATION DATA: UPSTREAM(FEET) =   1103.00  DOWNSTREAM(FEET) =   1095.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   427.00   CHANNEL SLOPE =  0.0187
 CHANNEL BASE(FEET) =    8.00   "Z" FACTOR =   6.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.609
 USER-SPECIFIED RUNOFF COEFFICIENT = .8832
 SOIL CLASSIFICATION IS "C"
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      33.96
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.25
 AVERAGE FLOW DEPTH(FEET) =   0.67   TRAVEL TIME(MIN.) =   1.68
 Tc(MIN.) =   16.89
 SUBAREA AREA(ACRES) =     5.20       SUBAREA RUNOFF(CFS) =   11.98
 TOTAL AREA(ACRES) =       16.2         PEAK FLOW RATE(CFS) =      39.95

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.73   FLOW VELOCITY(FEET/SEC.) =   4.44
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    226.00 =    1809.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    226.00 TO NODE    230.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   1095.00  DOWNSTREAM(FEET) =   1085.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   646.00   CHANNEL SLOPE =  0.0155
 CHANNEL BASE(FEET) =    8.00   "Z" FACTOR =   6.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.423
 USER-SPECIFIED RUNOFF COEFFICIENT = .8822
 SOIL CLASSIFICATION IS "C"
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      48.82
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.43
 AVERAGE FLOW DEPTH(FEET) =   0.84   TRAVEL TIME(MIN.) =   2.43
 Tc(MIN.) =   19.32
 SUBAREA AREA(ACRES) =     8.30       SUBAREA RUNOFF(CFS) =   17.74
 TOTAL AREA(ACRES) =       24.5         PEAK FLOW RATE(CFS) =      57.69

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.92   FLOW VELOCITY(FEET/SEC.) =   4.64
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    230.00 =    2455.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    230.00 TO NODE    230.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.423
 USER-SPECIFIED RUNOFF COEFFICIENT = .8822
 SOIL CLASSIFICATION IS "C"
```

```
  SUBAREA AREA(ACRES) =    5.30   SUBAREA RUNOFF(CFS) =   11.33
  TOTAL AREA(ACRES) =       29.8   TOTAL RUNOFF(CFS) =      69.02
  TC(MIN.) =   19.32

****************************************************************************
  FLOW PROCESS FROM NODE    230.00 TO NODE    240.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1085.00  DOWNSTREAM(FEET) =   1078.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   622.00   CHANNEL SLOPE =  0.0113
  CHANNEL BASE(FEET) =   15.00   "Z" FACTOR =   8.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.263
  USER-SPECIFIED RUNOFF COEFFICIENT = .8812
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      82.29
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.05
  AVERAGE FLOW DEPTH(FEET) =   0.91   TRAVEL TIME(MIN.) =   2.56
  Tc(MIN.) =   21.88
  SUBAREA AREA(ACRES) =    13.30       SUBAREA RUNOFF(CFS) =   26.52
  TOTAL AREA(ACRES) =       43.1         PEAK FLOW RATE(CFS) =      95.54

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.98   FLOW VELOCITY(FEET/SEC.) =   4.26
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    240.00 =    3077.00 FEET.

  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       43.1  TC(MIN.) =     21.88
  PEAK FLOW RATE(CFS)   =      95.54
----------------------------------------------------------------------------
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```



```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
       RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                   (RCFC&WCD)  1978 HYDROLOGY MANUAL
        (c) Copyright 1982-2014 Advanced Engineering Software (aes)
                   (Rational Tabling Version 21.0)
                Release Date: 06/01/2014  License ID 1261

                         Analysis prepared by:

                        RICK ENGINEERING COMPANY
                            5620 Friars Road
                         San Diego, California 92110
                        619-291-0707   Fax 619-291-4165

 ************************* DESCRIPTION OF STUDY *************************
* MADISON AVE STREET IMPROVEMENTS, J-18099                              *
* ULTIMATE BUILD OUT CONDITION 100-YR, BASIN 300                        *
* w:\18099\WaterResources\Hydrology\RationalMethod\...                  *
 ************************************************************************

  FILE NAME: MA300E00.RAT
  TIME/DATE OF STUDY: 10:51 07/23/2018
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.360
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.880
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.480
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.300
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.5505732
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.5495536
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.300
  SLOPE OF INTENSITY DURATION CURVE = 0.5496
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```

```
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

+---------------------------------------------------------------------------+
| ULTIMATE BUILD OUT CONIDTIONS ARE BEING MODELED BASED ON THE CITY OF      |
| MURRIETA'S GENERAL PLAN 2035 LAND USE MAP                                 |
|                                                                           |
+---------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    302.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    71.00
  UPSTREAM ELEVATION(FEET) =   1125.00
  DOWNSTREAM ELEVATION(FEET) =   1122.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  TC = 0.303*[(   71.00**3)/(     3.00)]**.2 =    3.140
  COMPUTED TIME OF CONCENTRATION INCREASED TO 5 MIN.
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.093
  USER-SPECIFIED RUNOFF COEFFICIENT = .8905
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.45
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.45

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    310.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1122.00  DOWNSTREAM(FEET) =   1091.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   531.00   CHANNEL SLOPE =  0.0584
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.175
  USER-SPECIFIED RUNOFF COEFFICIENT = .8887
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       9.27
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.06
  AVERAGE FLOW DEPTH(FEET) =   0.21   TRAVEL TIME(MIN.) =   2.18
  Tc(MIN.) =    7.18
  SUBAREA AREA(ACRES) =     4.70       SUBAREA RUNOFF(CFS) =   17.44
```

```
 TOTAL AREA(ACRES) =        4.8         PEAK FLOW RATE(CFS) =      17.89

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.31   FLOW VELOCITY(FEET/SEC.) =   5.14
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    310.00 =     602.00 FEET.
----------------------------------------------------------------------------
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =        4.8  TC(MIN.) =      7.18
 PEAK FLOW RATE(CFS)   =      17.89
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```



```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2014 Advanced Engineering Software (aes)
                    (Rational Tabling Version 21.0)
                Release Date: 06/01/2014  License ID 1261

                          Analysis prepared by:

                         RICK ENGINEERING COMPANY
                             5620 Friars Road
                          San Diego, California 92110
                        619-291-0707   Fax 619-291-4165

 ************************* DESCRIPTION OF STUDY *************************
* MADISON AVE STREET IMPROVEMENTS, J-18099                              *
* ULTIMATE BUILD OUT CONDITION 100-YR, BASIN 400                        *
* w:\18099\WaterResources\Hydrology\RationalMethod\...                  *
 ************************************************************************

  FILE NAME: MA400U00.RAT
  TIME/DATE OF STUDY: 11:48 07/23/2018
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.360
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.880
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.480
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.300
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.5505732
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.5495536
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.300
  SLOPE OF INTENSITY DURATION CURVE = 0.5496
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```

```
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

+---------------------------------------------------------------------------+
| ULTIMATE BUILD OUT CONDITIONS ARE BEING MODELED BASED ON THE CITY OF      |
| MURRIETA'S GENERAL PLAN 2035 LAND USE MAP                                 |
|                                                                           |
+---------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    402.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   123.00
  UPSTREAM ELEVATION(FEET) =   1154.00
  DOWNSTREAM ELEVATION(FEET) =   1153.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  TC = 0.303*[(  123.00**3)/(     1.00)]**.2 =    5.439
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.863
  USER-SPECIFIED RUNOFF COEFFICIENT = .8901
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.87
  TOTAL AREA(ACRES) =      0.20   TOTAL RUNOFF(CFS) =      0.87

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    405.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1153.00  DOWNSTREAM(FEET) =   1143.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   600.00   CHANNEL SLOPE =  0.0167
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   8.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.067
  USER-SPECIFIED RUNOFF COEFFICIENT = .8884
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      15.83
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.78
  AVERAGE FLOW DEPTH(FEET) =   0.27   TRAVEL TIME(MIN.) =   2.09
  Tc(MIN.) =    7.53
  SUBAREA AREA(ACRES) =     8.20       SUBAREA RUNOFF(CFS) =   29.63
  TOTAL AREA(ACRES) =        8.4         PEAK FLOW RATE(CFS) =      30.50
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.39   FLOW VELOCITY(FEET/SEC.) =   5.92
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    405.00 =     723.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    405.00 TO NODE    410.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1143.00  DOWNSTREAM(FEET) =   1135.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   713.00   CHANNEL SLOPE =  0.0112
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   8.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.613
  USER-SPECIFIED RUNOFF COEFFICIENT = .8872
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      67.29
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.56
  AVERAGE FLOW DEPTH(FEET) =   0.67   TRAVEL TIME(MIN.) =   1.81
  Tc(MIN.) =    9.34
  SUBAREA AREA(ACRES) =    22.90       SUBAREA RUNOFF(CFS) =   73.40
  TOTAL AREA(ACRES) =       31.3         PEAK FLOW RATE(CFS) =     103.90

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.84   FLOW VELOCITY(FEET/SEC.) =   7.44
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    410.00 =    1436.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    410.00 TO NODE    420.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1135.00  DOWNSTREAM(FEET) =   1112.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   790.00   CHANNEL SLOPE =  0.0291
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   8.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.379
  USER-SPECIFIED RUNOFF COEFFICIENT = .8661
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     118.53
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  10.87
  AVERAGE FLOW DEPTH(FEET) =   0.70   TRAVEL TIME(MIN.) =   1.21
  Tc(MIN.) =   10.55
  SUBAREA AREA(ACRES) =    10.00       SUBAREA RUNOFF(CFS) =   29.26
  TOTAL AREA(ACRES) =       41.3         PEAK FLOW RATE(CFS) =     133.16

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
```

```
  DEPTH(FEET) =  0.74   FLOW VELOCITY(FEET/SEC.) =  11.20
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    420.00 =    2226.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    420.00 TO NODE    420.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.379
  USER-SPECIFIED RUNOFF COEFFICIENT = .8322
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    8.90   SUBAREA RUNOFF(CFS) =   25.03
  TOTAL AREA(ACRES) =       50.2   TOTAL RUNOFF(CFS) =     158.19
  TC(MIN.) =   10.55

****************************************************************************
  FLOW PROCESS FROM NODE    420.00 TO NODE    430.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1109.00  DOWNSTREAM(FEET) =  1108.00
  FLOW LENGTH(FEET) =   599.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  72.0 INCH PIPE IS  56.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.62
  ESTIMATED PIPE DIAMETER(INCH) =  72.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     158.19
  PIPE TRAVEL TIME(MIN.) =   1.51    Tc(MIN.) =   12.06
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    430.00 =    2825.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    430.00 TO NODE    430.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.140
  USER-SPECIFIED RUNOFF COEFFICIENT = .8135
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =   15.90   SUBAREA RUNOFF(CFS) =   40.61
  TOTAL AREA(ACRES) =       66.1   TOTAL RUNOFF(CFS) =     198.79
  TC(MIN.) =   12.06

****************************************************************************
  FLOW PROCESS FROM NODE    430.00 TO NODE    435.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1108.00  DOWNSTREAM(FEET) =  1107.00
  FLOW LENGTH(FEET) =   336.00   MANNING'S N =  0.013
```

```
  DEPTH OF FLOW IN  72.0 INCH PIPE IS  53.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.79
  ESTIMATED PIPE DIAMETER(INCH) =  72.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     198.79
  PIPE TRAVEL TIME(MIN.) =   0.64    Tc(MIN.) =   12.70
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    435.00 =    3161.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    435.00 TO NODE    435.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.052
  USER-SPECIFIED RUNOFF COEFFICIENT = .8631
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    3.20   SUBAREA RUNOFF(CFS) =    8.43
  TOTAL AREA(ACRES) =       69.3   TOTAL RUNOFF(CFS) =     207.22
  TC(MIN.) =   12.70

****************************************************************************
  FLOW PROCESS FROM NODE    435.00 TO NODE    437.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1107.00  DOWNSTREAM(FEET) =  1088.00
  FLOW LENGTH(FEET) =   701.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  48.0 INCH PIPE IS  36.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  20.29
  ESTIMATED PIPE DIAMETER(INCH) =  48.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     207.22
  PIPE TRAVEL TIME(MIN.) =   0.58    Tc(MIN.) =   13.27
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    437.00 =    3862.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    437.00 TO NODE    480.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1088.00  DOWNSTREAM(FEET) =   1070.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  2011.00   CHANNEL SLOPE =  0.0090
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.456
  USER-SPECIFIED RUNOFF COEFFICIENT = .8824
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     242.52
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.01
  AVERAGE FLOW DEPTH(FEET) =   2.16   TRAVEL TIME(MIN.) =   5.58
```

```
  Tc(MIN.) =   18.85
  SUBAREA AREA(ACRES) =    32.50       SUBAREA RUNOFF(CFS) =   70.43
  TOTAL AREA(ACRES) =      101.8         PEAK FLOW RATE(CFS) =     277.66

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  2.31   FLOW VELOCITY(FEET/SEC.) =   6.23
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    480.00 =    5873.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    480.00 TO NODE    480.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    440.00 TO NODE    442.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   164.00
  UPSTREAM ELEVATION(FEET) =   1135.00
  DOWNSTREAM ELEVATION(FEET) =   1130.00
  ELEVATION DIFFERENCE(FEET) =      5.00
  TC = 0.303*[(  164.00**3)/(     5.00)]**.2 =    4.685
  COMPUTED TIME OF CONCENTRATION INCREASED TO 5 MIN.
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.093
  USER-SPECIFIED RUNOFF COEFFICIENT = .8905
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.91
  TOTAL AREA(ACRES) =      0.20   TOTAL RUNOFF(CFS) =      0.91

****************************************************************************
  FLOW PROCESS FROM NODE    442.00 TO NODE    443.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1130.00  DOWNSTREAM ELEVATION(FEET) = 1122.00
  STREET LENGTH(FEET) =   989.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  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) =       3.98
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.40
    HALFSTREET FLOOD WIDTH(FEET) =   13.24
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.26
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.90
  STREET FLOW TRAVEL TIME(MIN.) =   7.28   Tc(MIN.) =   12.28
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.108
  USER-SPECIFIED RUNOFF COEFFICIENT = .8709
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    2.20      SUBAREA RUNOFF(CFS) =    5.95
  TOTAL AREA(ACRES) =        2.4        PEAK FLOW RATE(CFS) =       6.86

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.46   HALFSTREET FLOOD WIDTH(FEET) =  16.60
  FLOW VELOCITY(FEET/SEC.) =  2.58   DEPTH*VELOCITY(FT*FT/SEC.) =   1.19
  LONGEST FLOWPATH FROM NODE    440.00 TO NODE    443.00 =    1153.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    443.00 TO NODE    445.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1122.00  DOWNSTREAM(FEET) =   1101.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   766.00   CHANNEL SLOPE =  0.0274
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.736
  USER-SPECIFIED RUNOFF COEFFICIENT = .8838
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      18.03
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.98
  AVERAGE FLOW DEPTH(FEET) =   0.39   TRAVEL TIME(MIN.) =   3.21
  Tc(MIN.) =   15.49
  SUBAREA AREA(ACRES) =     9.20       SUBAREA RUNOFF(CFS) =   22.24
  TOTAL AREA(ACRES) =       11.6         PEAK FLOW RATE(CFS) =      29.11

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.51   FLOW VELOCITY(FEET/SEC.) =   4.70
  LONGEST FLOWPATH FROM NODE    440.00 TO NODE    445.00 =    1919.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    445.00 TO NODE    445.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
```

```
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.736
  USER-SPECIFIED RUNOFF COEFFICIENT = .8838
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    2.50   SUBAREA RUNOFF(CFS) =    6.04
  TOTAL AREA(ACRES) =       14.1   TOTAL RUNOFF(CFS) =      35.15
  TC(MIN.) =   15.49

****************************************************************************
  FLOW PROCESS FROM NODE    445.00 TO NODE    447.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1098.00  DOWNSTREAM(FEET) =  1095.00
  FLOW LENGTH(FEET) =   300.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  22.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.98
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      35.15
  PIPE TRAVEL TIME(MIN.) =   0.56    Tc(MIN.) =   16.05
  LONGEST FLOWPATH FROM NODE    440.00 TO NODE    447.00 =    2219.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    447.00 TO NODE    447.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.683
  USER-SPECIFIED RUNOFF COEFFICIENT = .8671
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    3.10   SUBAREA RUNOFF(CFS) =    7.21
  TOTAL AREA(ACRES) =       17.2   TOTAL RUNOFF(CFS) =      42.36
  TC(MIN.) =   16.05

****************************************************************************
  FLOW PROCESS FROM NODE    447.00 TO NODE    449.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1095.00  DOWNSTREAM(FEET) =  1092.00
  FLOW LENGTH(FEET) =   313.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  23.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.31
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      42.36
  PIPE TRAVEL TIME(MIN.) =   0.56    Tc(MIN.) =   16.61
  LONGEST FLOWPATH FROM NODE    440.00 TO NODE    449.00 =    2532.00 FEET.

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

```
 FLOW PROCESS FROM NODE    449.00 TO NODE    449.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.633
 USER-SPECIFIED RUNOFF COEFFICIENT = .7999
 SOIL CLASSIFICATION IS "C"
 SUBAREA AREA(ACRES) =   16.70   SUBAREA RUNOFF(CFS) =   35.17
 TOTAL AREA(ACRES) =       33.9   TOTAL RUNOFF(CFS) =      77.54
 TC(MIN.) =   16.61

****************************************************************************
 FLOW PROCESS FROM NODE    449.00 TO NODE    450.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  1092.00  DOWNSTREAM(FEET) =  1082.00
 FLOW LENGTH(FEET) =   368.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  33.0 INCH PIPE IS  25.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  15.85
 ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      77.54
 PIPE TRAVEL TIME(MIN.) =   0.39    Tc(MIN.) =   17.00
 LONGEST FLOWPATH FROM NODE    440.00 TO NODE    450.00 =    2900.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    450.00 TO NODE    470.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   1082.00  DOWNSTREAM(FEET) =   1078.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   482.00   CHANNEL SLOPE =  0.0083
 CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.456
 USER-SPECIFIED RUNOFF COEFFICIENT = .8824
 SOIL CLASSIFICATION IS "C"
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      83.39
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.32
 AVERAGE FLOW DEPTH(FEET) =   1.28   TRAVEL TIME(MIN.) =   1.86
 Tc(MIN.) =   18.86
 SUBAREA AREA(ACRES) =     5.40       SUBAREA RUNOFF(CFS) =   11.70
 TOTAL AREA(ACRES) =       39.3         PEAK FLOW RATE(CFS) =      89.24

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  1.32   FLOW VELOCITY(FEET/SEC.) =   4.41
 LONGEST FLOWPATH FROM NODE    440.00 TO NODE    470.00 =    3382.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    470.00 TO NODE    470.00 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.) =   18.86
  RAINFALL INTENSITY(INCH/HR) =   2.46
  TOTAL STREAM AREA(ACRES) =    39.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     89.24

****************************************************************************
  FLOW PROCESS FROM NODE    460.00 TO NODE    462.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY(1/2 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   142.00
  UPSTREAM ELEVATION(FEET) =   1114.00
  DOWNSTREAM ELEVATION(FEET) =   1111.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  TC = 0.422*[(  142.00**3)/(     3.00)]**.2 =    6.628
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.363
  USER-SPECIFIED RUNOFF COEFFICIENT = .8348
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.73
  TOTAL AREA(ACRES) =      0.20   TOTAL RUNOFF(CFS) =      0.73

****************************************************************************
  FLOW PROCESS FROM NODE    462.00 TO NODE    465.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1111.00  DOWNSTREAM(FEET) =   1110.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   275.00   CHANNEL SLOPE =  0.0036
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.153
  USER-SPECIFIED RUNOFF COEFFICIENT = .8138
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.51
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.86
  AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   5.34
  Tc(MIN.) =   11.96
  SUBAREA AREA(ACRES) =     0.60       SUBAREA RUNOFF(CFS) =    1.54
  TOTAL AREA(ACRES) =        0.8         PEAK FLOW RATE(CFS) =       2.27
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.21   FLOW VELOCITY(FEET/SEC.) =   1.00
  LONGEST FLOWPATH FROM NODE    460.00 TO NODE    465.00 =     417.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    465.00 TO NODE    467.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1107.00  DOWNSTREAM(FEET) =  1105.00
  FLOW LENGTH(FEET) =   250.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.21
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.27
  PIPE TRAVEL TIME(MIN.) =   0.99    Tc(MIN.) =   12.95
  LONGEST FLOWPATH FROM NODE    460.00 TO NODE    467.00 =     667.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    467.00 TO NODE    470.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1105.00  DOWNSTREAM(FEET) =   1078.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   567.00   CHANNEL SLOPE =  0.0476
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.712
  USER-SPECIFIED RUNOFF COEFFICIENT = .8837
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.84
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.39
  AVERAGE FLOW DEPTH(FEET) =   0.19   TRAVEL TIME(MIN.) =   2.79
  Tc(MIN.) =   15.75
  SUBAREA AREA(ACRES) =     3.80       SUBAREA RUNOFF(CFS) =    9.11
  TOTAL AREA(ACRES) =        4.6         PEAK FLOW RATE(CFS) =      11.37

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.25   FLOW VELOCITY(FEET/SEC.) =   4.05
  LONGEST FLOWPATH FROM NODE    460.00 TO NODE    470.00 =    1234.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    470.00 TO NODE    470.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
```

```
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   15.75
  RAINFALL INTENSITY(INCH/HR) =   2.71
  TOTAL STREAM AREA(ACRES) =     4.60
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     11.37

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       89.24    18.86        2.456         39.30
      2       11.37    15.75        2.712          4.60

 ********************************WARNING*********************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ************************************************************************

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       85.89    15.75       2.712
      2       99.54    18.86       2.456

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      99.54   Tc(MIN.) =   18.86
  TOTAL AREA(ACRES) =       43.9
  LONGEST FLOWPATH FROM NODE    440.00 TO NODE    470.00 =    3382.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    470.00 TO NODE    480.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1078.00  DOWNSTREAM(FEET) =   1070.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   716.00   CHANNEL SLOPE =  0.0112
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.304
  USER-SPECIFIED RUNOFF COEFFICIENT = .8814
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     105.84
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.15
  AVERAGE FLOW DEPTH(FEET) =   1.34   TRAVEL TIME(MIN.) =   2.32
```

```
  Tc(MIN.) =   21.17
  SUBAREA AREA(ACRES) =     6.20       SUBAREA RUNOFF(CFS) =   12.59
  TOTAL AREA(ACRES) =       50.1         PEAK FLOW RATE(CFS) =     112.13

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.38   FLOW VELOCITY(FEET/SEC.) =   5.25
  LONGEST FLOWPATH FROM NODE    440.00 TO NODE    480.00 =    4098.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    480.00 TO NODE    480.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF       Tc       INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1      112.13    21.17       2.304       50.10
  LONGEST FLOWPATH FROM NODE    440.00 TO NODE    480.00 =    4098.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF       Tc       INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1      277.66    18.85       2.456      101.80
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    480.00 =    5873.00 FEET.

 ****************************WARNING*********************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ********************************************************************

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc       INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1     377.50      18.85        2.456
      2     372.63      21.17        2.304

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     377.50   Tc(MIN.) =   18.85
  TOTAL AREA(ACRES) =      151.9

****************************************************************************
  FLOW PROCESS FROM NODE    480.00 TO NODE    480.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    480.00 TO NODE    490.00 IS CODE =  51
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1070.00  DOWNSTREAM(FEET) =   1064.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   591.00   CHANNEL SLOPE =  0.0102
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.363
  USER-SPECIFIED RUNOFF COEFFICIENT = .8818
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     392.08
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   7.15
  AVERAGE FLOW DEPTH(FEET) =   2.66   TRAVEL TIME(MIN.) =   1.38
  Tc(MIN.) =   20.23
  SUBAREA AREA(ACRES) =    14.00       SUBAREA RUNOFF(CFS) =   29.17
  TOTAL AREA(ACRES) =      165.9         PEAK FLOW RATE(CFS) =     406.67

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  2.70   FLOW VELOCITY(FEET/SEC.) =   7.23
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    490.00 =    6464.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =      165.9  TC(MIN.) =     20.23
  PEAK FLOW RATE(CFS)   =     406.67
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```



```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2014 Advanced Engineering Software (aes)
                    (Rational Tabling Version 21.0)
                Release Date: 06/01/2014  License ID 1261

                          Analysis prepared by:

                         RICK ENGINEERING COMPANY
                             5620 Friars Road
                          San Diego, California 92110
                        619-291-0707   Fax 619-291-4165

 ************************* DESCRIPTION OF STUDY *************************
* MADISON AVE STREET IMPROVEMENTS, J-18099                              *
* ULTIMATE BUILD OUT CONDITION 100-YR, BASIN 500                        *
* w:\18099\WaterResources\Hydrology\RationalMethod\...                  *
 ************************************************************************

  FILE NAME: MA500U00.RAT
  TIME/DATE OF STUDY: 11:58 07/23/2018
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.360
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.880
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.480
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.300
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.5505732
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.5495536
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.300
  SLOPE OF INTENSITY DURATION CURVE = 0.5496
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```

```
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

+---------------------------------------------------------------------------+
| ULTIMATE BUILD OUT CONDITIONS ARE BEING MODELED BASED ON THE CITY OF      |
| MURRIETA'S GENERAL PLAN 2035 LAND USE MAP                                 |
|                                                                           |
+---------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    502.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS CONDOMINIUM
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   130.00
  UPSTREAM ELEVATION(FEET) =   1114.00
  DOWNSTREAM ELEVATION(FEET) =   1113.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  TC = 0.359*[(  130.00**3)/(     1.00)]**.2 =    6.663
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.350
  USER-SPECIFIED RUNOFF COEFFICIENT = .8619
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      1.12
  TOTAL AREA(ACRES) =      0.30   TOTAL RUNOFF(CFS) =      1.12

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    505.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1113.00  DOWNSTREAM(FEET) =   1109.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   711.00   CHANNEL SLOPE =  0.0056
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.694
  USER-SPECIFIED RUNOFF COEFFICIENT = .8427
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.01
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.28
  AVERAGE FLOW DEPTH(FEET) =   0.22   TRAVEL TIME(MIN.) =   9.27
  Tc(MIN.) =   15.94
  SUBAREA AREA(ACRES) =     1.60       SUBAREA RUNOFF(CFS) =    3.63
  TOTAL AREA(ACRES) =        1.9         PEAK FLOW RATE(CFS) =       4.76
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.29   FLOW VELOCITY(FEET/SEC.) =   1.50
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    505.00 =     841.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    505.00 TO NODE    510.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1104.00  DOWNSTREAM(FEET) =  1097.00
  FLOW LENGTH(FEET) =   295.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.67
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.76
  PIPE TRAVEL TIME(MIN.) =   0.64    Tc(MIN.) =   16.58
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    510.00 =    1136.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    510.00 TO NODE    510.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.636
  USER-SPECIFIED RUNOFF COEFFICIENT = .8167
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    4.20   SUBAREA RUNOFF(CFS) =    9.04
  TOTAL AREA(ACRES) =        6.1   TOTAL RUNOFF(CFS) =      13.80
  TC(MIN.) =   16.58

****************************************************************************
  FLOW PROCESS FROM NODE    510.00 TO NODE    520.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1097.00  DOWNSTREAM(FEET) =   1083.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   719.00   CHANNEL SLOPE =  0.0195
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.405
  USER-SPECIFIED RUNOFF COEFFICIENT = .8821
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      24.62
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.97
  AVERAGE FLOW DEPTH(FEET) =   0.51   TRAVEL TIME(MIN.) =   3.02
  Tc(MIN.) =   19.59
```

```
  SUBAREA AREA(ACRES) =    10.20       SUBAREA RUNOFF(CFS) =   21.63
  TOTAL AREA(ACRES) =       16.3         PEAK FLOW RATE(CFS) =      35.43

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.63   FLOW VELOCITY(FEET/SEC.) =   4.49
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    520.00 =    1855.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    520.00 TO NODE    520.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.405
  USER-SPECIFIED RUNOFF COEFFICIENT = .8821
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    4.80   SUBAREA RUNOFF(CFS) =   10.18
  TOTAL AREA(ACRES) =       21.1   TOTAL RUNOFF(CFS) =      45.61
  TC(MIN.) =   19.59

****************************************************************************
  FLOW PROCESS FROM NODE    520.00 TO NODE    530.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1083.00  DOWNSTREAM(FEET) =   1074.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   530.00   CHANNEL SLOPE =  0.0170
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.289
  USER-SPECIFIED RUNOFF COEFFICIENT = .8813
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      51.36
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.82
  AVERAGE FLOW DEPTH(FEET) =   0.81   TRAVEL TIME(MIN.) =   1.83
  Tc(MIN.) =   21.43
  SUBAREA AREA(ACRES) =     5.70       SUBAREA RUNOFF(CFS) =   11.50
  TOTAL AREA(ACRES) =       26.8         PEAK FLOW RATE(CFS) =      57.11

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.86   FLOW VELOCITY(FEET/SEC.) =   4.96
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    530.00 =    2385.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    530.00 TO NODE    530.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.289
  USER-SPECIFIED RUNOFF COEFFICIENT = .8813
```

```
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    6.70   SUBAREA RUNOFF(CFS) =   13.52
  TOTAL AREA(ACRES) =       33.5   TOTAL RUNOFF(CFS) =      70.63
  TC(MIN.) =   21.43

****************************************************************************
  FLOW PROCESS FROM NODE    530.00 TO NODE    540.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1074.00  DOWNSTREAM(FEET) =   1071.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   302.00   CHANNEL SLOPE =  0.0099
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.227
  USER-SPECIFIED RUNOFF COEFFICIENT = .8809
  SOIL CLASSIFICATION IS "C"
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      78.68
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.53
  AVERAGE FLOW DEPTH(FEET) =   1.18   TRAVEL TIME(MIN.) =   1.11
  Tc(MIN.) =   22.54
  SUBAREA AREA(ACRES) =     8.20       SUBAREA RUNOFF(CFS) =   16.08
  TOTAL AREA(ACRES) =       41.7         PEAK FLOW RATE(CFS) =      86.72

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.24   FLOW VELOCITY(FEET/SEC.) =   4.67
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    540.00 =    2687.00 FEET.
----------------------------------------------------------------------------
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       41.7  TC(MIN.) =     22.54
  PEAK FLOW RATE(CFS)   =      86.72
----------------------------------------------------------------------------
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```



Appendix C

On-site AES Output

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
         RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                      (RCFC&WCD)  1978 HYDROLOGY MANUAL
          (c) Copyright 1982-2014 Advanced Engineering Software (aes)
                      (Rational Tabling Version 21.0)
                  Release Date: 06/01/2014  License ID 1261

                           Analysis prepared by:

                          RICK ENGINEERING COMPANY
                              5620 Friars Road
                            San Diego, California 92110
                          619-291-0707   Fax 619-291-4165

 ************************* DESCRIPTION OF STUDY *************************
* MADISON AVENUE IMPROVEMENT PROJECT FROM GUAVA STREET TO ELM STREET       *
* RATIONAL METHOD FOR A 10-YEAR STORM                                     *
* JN: 18099                                                               *
 **************************************************************************

  FILE NAME: MA1PR10.RAT
  TIME/DATE OF STUDY: 08:10 03/06/2024
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.150
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.120
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.580
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.700
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.3639657
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4156441
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) =   1.131
  SLOPE OF INTENSITY DURATION CURVE = 0.3640
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
  2   15.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0100 0.125 0.0180
```

```
  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    602.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   257.00
  UPSTREAM ELEVATION(FEET) =   1107.00
  DOWNSTREAM ELEVATION(FEET) =   1095.00
  ELEVATION DIFFERENCE(FEET) =     12.00
  TC = 0.303*[(  257.00**3)/(    12.00)]**.2 =    5.149
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.765
  USER-SPECIFIED RUNOFF COEFFICIENT = .8875
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.86
  TOTAL AREA(ACRES) =      0.35   TOTAL RUNOFF(CFS) =      0.86

****************************************************************************
  FLOW PROCESS FROM NODE    602.00 TO NODE    604.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1095.00  DOWNSTREAM ELEVATION(FEET) = 1083.00
  STREET LENGTH(FEET) =   563.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  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) =       1.63
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.28
    HALFSTREET FLOOD WIDTH(FEET) =    6.66
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.77
```

```
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.78
  STREET FLOW TRAVEL TIME(MIN.) =   3.38   Tc(MIN.) =    8.53
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.301
  USER-SPECIFIED RUNOFF COEFFICIENT = .8854
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.76      SUBAREA RUNOFF(CFS) =    1.55
  TOTAL AREA(ACRES) =        1.1        PEAK FLOW RATE(CFS) =       2.41

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.31   HALFSTREET FLOOD WIDTH(FEET) =   8.28
  FLOW VELOCITY(FEET/SEC.) =  2.99   DEPTH*VELOCITY(FT*FT/SEC.) =   0.93
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    604.00 =     820.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    604.00 TO NODE    604.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.301
  USER-SPECIFIED RUNOFF COEFFICIENT = .8854
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.62   SUBAREA RUNOFF(CFS) =    1.26
  TOTAL AREA(ACRES) =        1.7   TOTAL RUNOFF(CFS) =       3.67
  TC(MIN.) =    8.53

****************************************************************************
  FLOW PROCESS FROM NODE    700.00 TO NODE    702.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   250.00
  UPSTREAM ELEVATION(FEET) =   1104.00
  DOWNSTREAM ELEVATION(FEET) =   1095.00
  ELEVATION DIFFERENCE(FEET) =      9.00
  TC = 0.303*[(  250.00**3)/(     9.00)]**.2 =    5.364
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.724
  USER-SPECIFIED RUNOFF COEFFICIENT = .8874
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.65
  TOTAL AREA(ACRES) =      0.27   TOTAL RUNOFF(CFS) =      0.65

****************************************************************************
  FLOW PROCESS FROM NODE    702.00 TO NODE    704.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
```

```
  UPSTREAM ELEVATION(FEET) = 1095.00  DOWNSTREAM ELEVATION(FEET) = 1083.00
  STREET LENGTH(FEET) =   530.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  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) =       1.48
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.27
    HALFSTREET FLOOD WIDTH(FEET) =    6.09
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.82
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.76
  STREET FLOW TRAVEL TIME(MIN.) =   3.14   Tc(MIN.) =    8.50
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.304
  USER-SPECIFIED RUNOFF COEFFICIENT = .8854
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.81      SUBAREA RUNOFF(CFS) =    1.65
  TOTAL AREA(ACRES) =        1.1        PEAK FLOW RATE(CFS) =       2.30

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.30   HALFSTREET FLOOD WIDTH(FEET) =   7.97
  FLOW VELOCITY(FEET/SEC.) =  3.03   DEPTH*VELOCITY(FT*FT/SEC.) =   0.92
  LONGEST FLOWPATH FROM NODE    700.00 TO NODE    704.00 =     780.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    704.00 TO NODE    704.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.304
  USER-SPECIFIED RUNOFF COEFFICIENT = .8854
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.55   SUBAREA RUNOFF(CFS) =    1.12
  TOTAL AREA(ACRES) =        1.6   TOTAL RUNOFF(CFS) =       3.43
  TC(MIN.) =    8.50

****************************************************************************
  FLOW PROCESS FROM NODE    800.00 TO NODE    802.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
```

```
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   254.00
  UPSTREAM ELEVATION(FEET) =   1107.00
  DOWNSTREAM ELEVATION(FEET) =   1097.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  TC = 0.303*[(  254.00**3)/(    10.00)]**.2 =    5.303
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.736
  USER-SPECIFIED RUNOFF COEFFICIENT = .8874
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.73
  TOTAL AREA(ACRES) =      0.30   TOTAL RUNOFF(CFS) =      0.73

****************************************************************************
  FLOW PROCESS FROM NODE    802.00 TO NODE    804.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1095.00  DOWNSTREAM ELEVATION(FEET) = 1086.50
  STREET LENGTH(FEET) =   474.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 15.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.10
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.24
    HALFSTREET FLOOD WIDTH(FEET) =    6.76
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.02
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.48
  STREET FLOW TRAVEL TIME(MIN.) =   3.92   Tc(MIN.) =    9.22
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.237
  USER-SPECIFIED RUNOFF COEFFICIENT = .8851
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.37      SUBAREA RUNOFF(CFS) =    0.73
  TOTAL AREA(ACRES) =        0.7        PEAK FLOW RATE(CFS) =       1.46

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.26   HALFSTREET FLOOD WIDTH(FEET) =   7.70
  FLOW VELOCITY(FEET/SEC.) =  2.15   DEPTH*VELOCITY(FT*FT/SEC.) =   0.56
  LONGEST FLOWPATH FROM NODE    800.00 TO NODE    804.00 =     728.00 FEET.

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

```
  FLOW PROCESS FROM NODE    804.00 TO NODE    804.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.237
  USER-SPECIFIED RUNOFF COEFFICIENT = .8851
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.19   SUBAREA RUNOFF(CFS) =    0.38
  TOTAL AREA(ACRES) =        0.9   TOTAL RUNOFF(CFS) =       1.84
  TC(MIN.) =    9.22

****************************************************************************
  FLOW PROCESS FROM NODE    900.00 TO NODE    902.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   251.00
  UPSTREAM ELEVATION(FEET) =   1104.00
  DOWNSTREAM ELEVATION(FEET) =   1097.00
  ELEVATION DIFFERENCE(FEET) =      7.00
  TC = 0.303*[(  251.00**3)/(     7.00)]**.2 =    5.654
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.672
  USER-SPECIFIED RUNOFF COEFFICIENT = .8872
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.71
  TOTAL AREA(ACRES) =      0.30   TOTAL RUNOFF(CFS) =      0.71

****************************************************************************
  FLOW PROCESS FROM NODE    902.00 TO NODE    904.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1095.00  DOWNSTREAM ELEVATION(FEET) = 1086.00
  STREET LENGTH(FEET) =   481.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  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) =       1.32
```

```
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.27
    HALFSTREET FLOOD WIDTH(FEET) =    6.03
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.54
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.69
  STREET FLOW TRAVEL TIME(MIN.) =   3.16   Tc(MIN.) =    8.81
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.274
  USER-SPECIFIED RUNOFF COEFFICIENT = .8853
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.60      SUBAREA RUNOFF(CFS) =    1.21
  TOTAL AREA(ACRES) =        0.9        PEAK FLOW RATE(CFS) =       1.92

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.30   HALFSTREET FLOOD WIDTH(FEET) =   7.59
  FLOW VELOCITY(FEET/SEC.) =  2.71   DEPTH*VELOCITY(FT*FT/SEC.) =   0.81
  LONGEST FLOWPATH FROM NODE    900.00 TO NODE    904.00 =     732.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    904.00 TO NODE    904.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.274
  USER-SPECIFIED RUNOFF COEFFICIENT = .8853
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.34   SUBAREA RUNOFF(CFS) =    0.68
  TOTAL AREA(ACRES) =        1.2   TOTAL RUNOFF(CFS) =       2.60
  TC(MIN.) =    8.81

****************************************************************************
  FLOW PROCESS FROM NODE   1000.00 TO NODE   1002.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   299.00
  UPSTREAM ELEVATION(FEET) =   1113.00
  DOWNSTREAM ELEVATION(FEET) =   1103.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  TC = 0.303*[(  299.00**3)/(    10.00)]**.2 =    5.848
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.640
  USER-SPECIFIED RUNOFF COEFFICIENT = .8870
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      1.17
  TOTAL AREA(ACRES) =      0.50   TOTAL RUNOFF(CFS) =      1.17

****************************************************************************
  FLOW PROCESS FROM NODE   1002.00 TO NODE   1004.00 IS CODE =  62
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1103.00  DOWNSTREAM ELEVATION(FEET) = 1092.00
  STREET LENGTH(FEET) =   370.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 15.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.92
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.26
    HALFSTREET FLOOD WIDTH(FEET) =    7.77
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.78
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.72
  STREET FLOW TRAVEL TIME(MIN.) =   2.22   Tc(MIN.) =    8.07
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.348
  USER-SPECIFIED RUNOFF COEFFICIENT = .8857
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.72      SUBAREA RUNOFF(CFS) =    1.50
  TOTAL AREA(ACRES) =        1.2        PEAK FLOW RATE(CFS) =       2.67

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.28   HALFSTREET FLOOD WIDTH(FEET) =   8.95
  FLOW VELOCITY(FEET/SEC.) =  3.01   DEPTH*VELOCITY(FT*FT/SEC.) =   0.85
  LONGEST FLOWPATH FROM NODE   1000.00 TO NODE   1004.00 =     669.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1100.00 TO NODE   1102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   250.00
  UPSTREAM ELEVATION(FEET) =   1106.00
  DOWNSTREAM ELEVATION(FEET) =   1103.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  TC = 0.303*[(  250.00**3)/(     3.00)]**.2 =    6.682
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.515
  USER-SPECIFIED RUNOFF COEFFICIENT = .8865
```

```
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.58
  TOTAL AREA(ACRES) =      0.26   TOTAL RUNOFF(CFS) =      0.58

****************************************************************************
  FLOW PROCESS FROM NODE   1102.00 TO NODE   1104.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1103.00  DOWNSTREAM ELEVATION(FEET) = 1092.00
  STREET LENGTH(FEET) =   363.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  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) =       1.40
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.26
    HALFSTREET FLOOD WIDTH(FEET) =    5.28
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.17
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.81
  STREET FLOW TRAVEL TIME(MIN.) =   1.91   Tc(MIN.) =    8.59
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.295
  USER-SPECIFIED RUNOFF COEFFICIENT = .8854
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.81      SUBAREA RUNOFF(CFS) =    1.65
  TOTAL AREA(ACRES) =        1.1        PEAK FLOW RATE(CFS) =       2.23

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   7.22
  FLOW VELOCITY(FEET/SEC.) =  3.38   DEPTH*VELOCITY(FT*FT/SEC.) =   0.98
  LONGEST FLOWPATH FROM NODE   1100.00 TO NODE   1104.00 =     613.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1200.00 TO NODE   1202.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   254.00
```

```
  UPSTREAM ELEVATION(FEET) =   1113.00
  DOWNSTREAM ELEVATION(FEET) =   1103.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  TC = 0.303*[(  254.00**3)/(    10.00)]**.2 =    5.303
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.736
  USER-SPECIFIED RUNOFF COEFFICIENT = .8874
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.61
  TOTAL AREA(ACRES) =      0.25   TOTAL RUNOFF(CFS) =      0.61

****************************************************************************
  FLOW PROCESS FROM NODE   1202.00 TO NODE   1204.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1103.00  DOWNSTREAM ELEVATION(FEET) = 1081.00
  STREET LENGTH(FEET) =   734.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 15.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.01
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.22
    HALFSTREET FLOOD WIDTH(FEET) =    5.74
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.42
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.53
  STREET FLOW TRAVEL TIME(MIN.) =   5.06   Tc(MIN.) =   10.36
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.144
  USER-SPECIFIED RUNOFF COEFFICIENT = .8845
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.42      SUBAREA RUNOFF(CFS) =    0.80
  TOTAL AREA(ACRES) =        0.7        PEAK FLOW RATE(CFS) =       1.40

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.24   HALFSTREET FLOOD WIDTH(FEET) =   6.76
  FLOW VELOCITY(FEET/SEC.) =  2.58   DEPTH*VELOCITY(FT*FT/SEC.) =   0.62
  LONGEST FLOWPATH FROM NODE   1200.00 TO NODE   1204.00 =     988.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1204.00 TO NODE   1204.00 IS CODE =  81
----------------------------------------------------------------------------
```

```
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.144
  USER-SPECIFIED RUNOFF COEFFICIENT = .8845
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.27   SUBAREA RUNOFF(CFS) =    0.51
  TOTAL AREA(ACRES) =        0.9   TOTAL RUNOFF(CFS) =       1.92
  TC(MIN.) =   10.36

****************************************************************************
  FLOW PROCESS FROM NODE   1300.00 TO NODE   1302.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   250.00
  UPSTREAM ELEVATION(FEET) =   1107.00
  DOWNSTREAM ELEVATION(FEET) =   1103.00
  ELEVATION DIFFERENCE(FEET) =      4.00
  TC = 0.303*[(  250.00**3)/(     4.00)]**.2 =    6.309
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.568
  USER-SPECIFIED RUNOFF COEFFICIENT = .8867
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.73
  TOTAL AREA(ACRES) =      0.32   TOTAL RUNOFF(CFS) =      0.73

****************************************************************************
  FLOW PROCESS FROM NODE   1302.00 TO NODE   1304.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1103.00  DOWNSTREAM ELEVATION(FEET) = 1081.00
  STREET LENGTH(FEET) =   745.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  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) =       1.50
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.26
```

```
    HALFSTREET FLOOD WIDTH(FEET) =    5.59
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.17
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.83
  STREET FLOW TRAVEL TIME(MIN.) =   3.91   Tc(MIN.) =   10.22
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.154
  USER-SPECIFIED RUNOFF COEFFICIENT = .8846
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.81      SUBAREA RUNOFF(CFS) =    1.54
  TOTAL AREA(ACRES) =        1.1        PEAK FLOW RATE(CFS) =       2.27

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   7.34
  FLOW VELOCITY(FEET/SEC.) =  3.36   DEPTH*VELOCITY(FT*FT/SEC.) =   0.99
  LONGEST FLOWPATH FROM NODE   1300.00 TO NODE   1304.00 =     995.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1304.00 TO NODE   1304.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.154
  USER-SPECIFIED RUNOFF COEFFICIENT = .8846
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.18   SUBAREA RUNOFF(CFS) =    0.34
  TOTAL AREA(ACRES) =        1.3   TOTAL RUNOFF(CFS) =       2.62
  TC(MIN.) =   10.22

****************************************************************************
  FLOW PROCESS FROM NODE   1400.00 TO NODE   1402.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   275.00
  UPSTREAM ELEVATION(FEET) =   1103.00
  DOWNSTREAM ELEVATION(FEET) =   1101.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  TC = 0.303*[(  275.00**3)/(     2.00)]**.2 =    7.673
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.391
  USER-SPECIFIED RUNOFF COEFFICIENT = .8859
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.15   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE   1402.00 TO NODE   1404.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
================================================================================
  UPSTREAM ELEVATION(FEET) = 1101.00  DOWNSTREAM ELEVATION(FEET) = 1084.00
  STREET LENGTH(FEET) =   638.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 15.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.60
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.19
    HALFSTREET FLOOD WIDTH(FEET) =    4.48
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.09
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.41
  STREET FLOW TRAVEL TIME(MIN.) =   5.09   Tc(MIN.) =   12.76
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.987
  USER-SPECIFIED RUNOFF COEFFICIENT = .8835
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.32      SUBAREA RUNOFF(CFS) =    0.56
  TOTAL AREA(ACRES) =        0.5        PEAK FLOW RATE(CFS) =       0.88

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.22   HALFSTREET FLOOD WIDTH(FEET) =   5.51
  FLOW VELOCITY(FEET/SEC.) =  2.26   DEPTH*VELOCITY(FT*FT/SEC.) =   0.49
  LONGEST FLOWPATH FROM NODE   1400.00 TO NODE   1404.00 =     913.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1500.00 TO NODE   1502.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   254.30
  UPSTREAM ELEVATION(FEET) =   1103.00
  DOWNSTREAM ELEVATION(FEET) =   1101.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  TC = 0.303*[(  254.30**3)/(     2.00)]**.2 =    7.321
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.432
  USER-SPECIFIED RUNOFF COEFFICIENT = .8861
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.56
```

```
  TOTAL AREA(ACRES) =      0.26   TOTAL RUNOFF(CFS) =      0.56

****************************************************************************
  FLOW PROCESS FROM NODE   1502.00 TO NODE   1504.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1101.00  DOWNSTREAM ELEVATION(FEET) = 1084.00
  STREET LENGTH(FEET) =   672.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  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) =       1.22
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.25
    HALFSTREET FLOOD WIDTH(FEET) =    5.03
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.89
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.73
  STREET FLOW TRAVEL TIME(MIN.) =   3.87   Tc(MIN.) =   11.19
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.084
  USER-SPECIFIED RUNOFF COEFFICIENT = .8842
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.71      SUBAREA RUNOFF(CFS) =    1.31
  TOTAL AREA(ACRES) =        1.0        PEAK FLOW RATE(CFS) =       1.87

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.28   HALFSTREET FLOOD WIDTH(FEET) =   6.84
  FLOW VELOCITY(FEET/SEC.) =  3.05   DEPTH*VELOCITY(FT*FT/SEC.) =   0.87
  LONGEST FLOWPATH FROM NODE   1500.00 TO NODE   1504.00 =     926.30 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1600.00 TO NODE   1602.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   221.00
  UPSTREAM ELEVATION(FEET) =   1103.00
  DOWNSTREAM ELEVATION(FEET) =   1099.00
```

```
  ELEVATION DIFFERENCE(FEET) =      4.00
  TC = 0.303*[(  221.00**3)/(     4.00)]**.2 =    5.859
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.638
  USER-SPECIFIED RUNOFF COEFFICIENT = .8870
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.33
  TOTAL AREA(ACRES) =      0.14   TOTAL RUNOFF(CFS) =      0.33

****************************************************************************
  FLOW PROCESS FROM NODE   1700.00 TO NODE   1702.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   224.00
  UPSTREAM ELEVATION(FEET) =   1103.00
  DOWNSTREAM ELEVATION(FEET) =   1099.00
  ELEVATION DIFFERENCE(FEET) =      4.00
  TC = 0.303*[(  224.00**3)/(     4.00)]**.2 =    5.906
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.630
  USER-SPECIFIED RUNOFF COEFFICIENT = .8870
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.56
  TOTAL AREA(ACRES) =      0.24   TOTAL RUNOFF(CFS) =      0.56
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.2  TC(MIN.) =      5.91
  PEAK FLOW RATE(CFS)   =       0.56
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2014 Advanced Engineering Software (aes)
                    (Rational Tabling Version 21.0)
                Release Date: 06/01/2014  License ID 1261

                          Analysis prepared by:

                         RICK ENGINEERING COMPANY
                             5620 Friars Road
                          San Diego, California 92110
                        619-291-0707   Fax 619-291-4165

 ************************* DESCRIPTION OF STUDY *************************
* MADISON AVENUE IMPROVEMENT PROJECT                                     *
* RATIONAL METHOD, 100-YEAR STORM                                        *
* JN: 18099                                                              *
 **************************************************************************

  FILE NAME: MA1PR00.RAT
  TIME/DATE OF STUDY: 17:40 03/04/2024
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.150
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.120
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.580
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.700
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.3639657
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4156441
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.700
  SLOPE OF INTENSITY DURATION CURVE = 0.4156
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
  2   15.0     10.0    0.020/0.020/0.020   0.50    1.50 0.0100 0.125 0.0180
```

```
  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

+---------------------------------------------------------------------------+
| BASIN 600 - 100-YEAR STORM                                                |
|                                                                           |
|                                                                           |
+---------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    602.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   257.00
  UPSTREAM ELEVATION(FEET) =   1107.00
  DOWNSTREAM ELEVATION(FEET) =   1095.00
  ELEVATION DIFFERENCE(FEET) =     12.00
  TC = 0.303*[(  257.00**3)/(    12.00)]**.2 =    5.149
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.717
  USER-SPECIFIED RUNOFF COEFFICIENT = .8923
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      1.47
  TOTAL AREA(ACRES) =      0.35   TOTAL RUNOFF(CFS) =      1.47

****************************************************************************
  FLOW PROCESS FROM NODE    602.00 TO NODE    604.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1095.00  DOWNSTREAM ELEVATION(FEET) = 1083.00
  STREET LENGTH(FEET) =   563.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200
```

```
    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.79
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.32
    HALFSTREET FLOOD WIDTH(FEET) =    8.97
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.06
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.99
  STREET FLOW TRAVEL TIME(MIN.) =   3.07   Tc(MIN.) =    8.21
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.885
  USER-SPECIFIED RUNOFF COEFFICIENT = .8908
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.76      SUBAREA RUNOFF(CFS) =    2.63
  TOTAL AREA(ACRES) =        1.1        PEAK FLOW RATE(CFS) =       4.10

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  10.82
  FLOW VELOCITY(FEET/SEC.) =  3.31   DEPTH*VELOCITY(FT*FT/SEC.) =   1.18
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    604.00 =     820.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    604.00 TO NODE    604.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.885
  USER-SPECIFIED RUNOFF COEFFICIENT = .8908
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.62   SUBAREA RUNOFF(CFS) =    2.15
  TOTAL AREA(ACRES) =        1.7   TOTAL RUNOFF(CFS) =       6.25
  TC(MIN.) =    8.21

+--------------------------------------------------------------------------+
| BASIN 700- 100-YEAR STORM                                                |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    700.00 TO NODE    702.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   250.00
  UPSTREAM ELEVATION(FEET) =   1104.00
  DOWNSTREAM ELEVATION(FEET) =   1095.00
  ELEVATION DIFFERENCE(FEET) =      9.00
  TC = 0.303*[(  250.00**3)/(     9.00)]**.2 =    5.364
```

```
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.638
  USER-SPECIFIED RUNOFF COEFFICIENT = .8921
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      1.12
  TOTAL AREA(ACRES) =      0.27   TOTAL RUNOFF(CFS) =      1.12

****************************************************************************
  FLOW PROCESS FROM NODE    702.00 TO NODE    704.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1095.00  DOWNSTREAM ELEVATION(FEET) = 1083.00
  STREET LENGTH(FEET) =   530.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.52
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.31
    HALFSTREET FLOOD WIDTH(FEET) =    8.34
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.09
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.96
  STREET FLOW TRAVEL TIME(MIN.) =   2.86   Tc(MIN.) =    8.22
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.884
  USER-SPECIFIED RUNOFF COEFFICIENT = .8908
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.81      SUBAREA RUNOFF(CFS) =    2.80
  TOTAL AREA(ACRES) =        1.1        PEAK FLOW RATE(CFS) =       3.92

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.35   HALFSTREET FLOOD WIDTH(FEET) =  10.43
  FLOW VELOCITY(FEET/SEC.) =  3.36   DEPTH*VELOCITY(FT*FT/SEC.) =   1.17
  LONGEST FLOWPATH FROM NODE    700.00 TO NODE    704.00 =     780.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    704.00 TO NODE    704.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.884
  USER-SPECIFIED RUNOFF COEFFICIENT = .8908
```

```
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.55   SUBAREA RUNOFF(CFS) =    1.90
  TOTAL AREA(ACRES) =        1.6   TOTAL RUNOFF(CFS) =       5.82
  TC(MIN.) =    8.22

+----------------------------------------------------------------------------+
| BASIN 800 - 100-YEAR STORM                                                 |
|                                                                            |
|                                                                            |
+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    800.00 TO NODE    802.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   254.00
  UPSTREAM ELEVATION(FEET) =   1107.00
  DOWNSTREAM ELEVATION(FEET) =   1097.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  TC = 0.303*[(  254.00**3)/(    10.00)]**.2 =    5.303
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.660
  USER-SPECIFIED RUNOFF COEFFICIENT = .8922
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      1.25
  TOTAL AREA(ACRES) =      0.30   TOTAL RUNOFF(CFS) =      1.25

****************************************************************************
  FLOW PROCESS FROM NODE    802.00 TO NODE    804.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1095.00  DOWNSTREAM ELEVATION(FEET) = 1086.50
  STREET LENGTH(FEET) =   474.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 15.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.87
```

```
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.28
    HALFSTREET FLOOD WIDTH(FEET) =    8.63
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.25
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.62
  STREET FLOW TRAVEL TIME(MIN.) =   3.51   Tc(MIN.) =    8.81
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.773
  USER-SPECIFIED RUNOFF COEFFICIENT = .8905
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.37      SUBAREA RUNOFF(CS) =    1.24
  TOTAL AREA(ACRES) =        0.7        PEAK FLOW RATE(CFS) =       2.49

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.30   HALFSTREET FLOOD WIDTH(FEET) =   9.73
  FLOW VELOCITY(FEET/SEC.) =  2.41   DEPTH*VELOCITY(FT*FT/SEC.) =   0.72
  LONGEST FLOWPATH FROM NODE    800.00 TO NODE    804.00 =     728.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    804.00 TO NODE    804.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.773
  USER-SPECIFIED RUNOFF COEFFICIENT = .8905
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.19   SUBAREA RUNOFF(CFS) =    0.64
  TOTAL AREA(ACRES) =        0.9   TOTAL RUNOFF(CFS) =       3.13
  TC(MIN.) =    8.81

+--------------------------------------------------------------------------+
| BASIN 900 - 100-YEAR STORM                                               |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    900.00 TO NODE    902.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   251.00
  UPSTREAM ELEVATION(FEET) =   1104.00
  DOWNSTREAM ELEVATION(FEET) =   1097.00
  ELEVATION DIFFERENCE(FEET) =      7.00
  TC = 0.303*[(  251.00**3)/(     7.00)]**.2 =    5.654
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.537
  USER-SPECIFIED RUNOFF COEFFICIENT = .8920
```

```
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      1.21
  TOTAL AREA(ACRES) =      0.30   TOTAL RUNOFF(CFS) =      1.21

****************************************************************************
  FLOW PROCESS FROM NODE    902.00 TO NODE    904.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1095.00  DOWNSTREAM ELEVATION(FEET) = 1086.00
  STREET LENGTH(FEET) =   481.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.24
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.31
    HALFSTREET FLOOD WIDTH(FEET) =    8.28
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.78
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.86
  STREET FLOW TRAVEL TIME(MIN.) =   2.89   Tc(MIN.) =    8.54
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.823
  USER-SPECIFIED RUNOFF COEFFICIENT = .8906
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.60      SUBAREA RUNOFF(CFS) =    2.04
  TOTAL AREA(ACRES) =        0.9        PEAK FLOW RATE(CFS) =       3.26

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =   9.97
  FLOW VELOCITY(FEET/SEC.) =  3.01   DEPTH*VELOCITY(FT*FT/SEC.) =   1.03
  LONGEST FLOWPATH FROM NODE    900.00 TO NODE    904.00 =     732.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    904.00 TO NODE    904.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.823
  USER-SPECIFIED RUNOFF COEFFICIENT = .8906
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.34   SUBAREA RUNOFF(CFS) =    1.16
```

```
  TOTAL AREA(ACRES) =        1.2   TOTAL RUNOFF(CFS) =       4.41
  TC(MIN.) =    8.54

+----------------------------------------------------------------------------+
| BASIN 1000 - 100-YEAR STORM                                                |
|                                                                            |
|                                                                            |
+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE   1000.00 TO NODE   1002.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   299.00
  UPSTREAM ELEVATION(FEET) =   1113.00
  DOWNSTREAM ELEVATION(FEET) =   1103.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  TC = 0.303*[(  299.00**3)/(    10.00)]**.2 =    5.848
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.474
  USER-SPECIFIED RUNOFF COEFFICIENT = .8919
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      2.00
  TOTAL AREA(ACRES) =      0.50   TOTAL RUNOFF(CFS) =      2.00

****************************************************************************
  FLOW PROCESS FROM NODE   1002.00 TO NODE   1004.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1103.00  DOWNSTREAM ELEVATION(FEET) = 1092.00
  STREET LENGTH(FEET) =   370.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 15.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.27
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
```

```
    HALFSTREET FLOOD WIDTH(FEET) =    9.80
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.12
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.94
  STREET FLOW TRAVEL TIME(MIN.) =   1.98   Tc(MIN.) =    7.82
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.964
  USER-SPECIFIED RUNOFF COEFFICIENT = .8909
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.72      SUBAREA RUNOFF(CFS) =    2.54
  TOTAL AREA(ACRES) =        1.2        PEAK FLOW RATE(CFS) =       4.54

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =  11.21
  FLOW VELOCITY(FEET/SEC.) =  3.38   DEPTH*VELOCITY(FT*FT/SEC.) =   1.11
  LONGEST FLOWPATH FROM NODE   1000.00 TO NODE   1004.00 =     669.00 FEET.

+-------------------------------------------------------------------------+
| BASIN 1100 - 100-YEAR STORM                                             |
|                                                                         |
|                                                                         |
+-------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE   1100.00 TO NODE   1102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   250.00
  UPSTREAM ELEVATION(FEET) =   1106.00
  DOWNSTREAM ELEVATION(FEET) =   1103.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  TC = 0.303*[(  250.00**3)/(     3.00)]**.2 =    6.682
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.233
  USER-SPECIFIED RUNOFF COEFFICIENT = .8914
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.98
  TOTAL AREA(ACRES) =      0.26   TOTAL RUNOFF(CFS) =      0.98

****************************************************************************
  FLOW PROCESS FROM NODE   1102.00 TO NODE   1104.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1103.00  DOWNSTREAM ELEVATION(FEET) = 1092.00
  STREET LENGTH(FEET) =   363.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00
```

```
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.37
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    7.47
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.42
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.01
  STREET FLOW TRAVEL TIME(MIN.) =   1.77   Tc(MIN.) =    8.45
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.839
  USER-SPECIFIED RUNOFF COEFFICIENT = .8907
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.81      SUBAREA RUNOFF(CFS) =    2.77
  TOTAL AREA(ACRES) =        1.1        PEAK FLOW RATE(CFS) =       3.75

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =   9.53
  FLOW VELOCITY(FEET/SEC.) =  3.73   DEPTH*VELOCITY(FT*FT/SEC.) =   1.24
  LONGEST FLOWPATH FROM NODE   1100.00 TO NODE   1104.00 =     613.00 FEET.

+----------------------------------------------------------------------------+
| BASIN 1200 - 100-YEAR STORM                                                |
|                                                                            |
|                                                                            |
+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE   1200.00 TO NODE   1202.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   254.00
  UPSTREAM ELEVATION(FEET) =   1113.00
  DOWNSTREAM ELEVATION(FEET) =   1103.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  TC = 0.303*[(  254.00**3)/(    10.00)]**.2 =    5.303
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.660
  USER-SPECIFIED RUNOFF COEFFICIENT = .8922
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      1.04
```

```
  TOTAL AREA(ACRES) =      0.25   TOTAL RUNOFF(CFS) =      1.04

****************************************************************************
  FLOW PROCESS FROM NODE   1202.00 TO NODE   1204.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1103.00  DOWNSTREAM ELEVATION(FEET) = 1081.00
  STREET LENGTH(FEET) =   734.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 15.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.72
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.25
    HALFSTREET FLOOD WIDTH(FEET) =    7.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.72
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.69
  STREET FLOW TRAVEL TIME(MIN.) =   4.50   Tc(MIN.) =    9.80
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.610
  USER-SPECIFIED RUNOFF COEFFICIENT = .8901
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.42      SUBAREA RUNOFF(CFS) =    1.35
  TOTAL AREA(ACRES) =        0.7        PEAK FLOW RATE(CFS) =       2.39

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.28   HALFSTREET FLOOD WIDTH(FEET) =   8.55
  FLOW VELOCITY(FEET/SEC.) =  2.92   DEPTH*VELOCITY(FT*FT/SEC.) =   0.81
  LONGEST FLOWPATH FROM NODE   1200.00 TO NODE   1204.00 =     988.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1204.00 TO NODE   1204.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.610
  USER-SPECIFIED RUNOFF COEFFICIENT = .8901
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.27   SUBAREA RUNOFF(CFS) =    0.87
  TOTAL AREA(ACRES) =        0.9   TOTAL RUNOFF(CFS) =       3.26
  TC(MIN.) =    9.80
```

```
+----------------------------------------------------------------------+
| BASIN 1300 - 100-YEAR STORM                                          |
|                                                                      |
|                                                                      |
+----------------------------------------------------------------------+

**********************************************************************
  FLOW PROCESS FROM NODE   1300.00 TO NODE   1302.00 IS CODE =  21
----------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
======================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   250.00
  UPSTREAM ELEVATION(FEET) =   1107.00
  DOWNSTREAM ELEVATION(FEET) =   1103.00
  ELEVATION DIFFERENCE(FEET) =      4.00
  TC = 0.303*[(  250.00**3)/(     4.00)]**.2 =    6.309
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.335
  USER-SPECIFIED RUNOFF COEFFICIENT = .8916
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      1.24
  TOTAL AREA(ACRES) =      0.32   TOTAL RUNOFF(CFS) =      1.24

**********************************************************************
  FLOW PROCESS FROM NODE   1302.00 TO NODE   1304.00 IS CODE =  62
----------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
======================================================================
  UPSTREAM ELEVATION(FEET) = 1103.00  DOWNSTREAM ELEVATION(FEET) = 1081.00
  STREET LENGTH(FEET) =   745.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.54
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    7.78
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.45
```

```
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.04
  STREET FLOW TRAVEL TIME(MIN.) =   3.60   Tc(MIN.) =    9.90
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.594
  USER-SPECIFIED RUNOFF COEFFICIENT = .8901
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.81      SUBAREA RUNOFF(CFS) =    2.59
  TOTAL AREA(ACRES) =        1.1        PEAK FLOW RATE(CFS) =       3.83

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =   9.66
  FLOW VELOCITY(FEET/SEC.) =  3.73   DEPTH*VELOCITY(FT*FT/SEC.) =   1.25
  LONGEST FLOWPATH FROM NODE   1300.00 TO NODE   1304.00 =     995.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1304.00 TO NODE   1304.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.594
  USER-SPECIFIED RUNOFF COEFFICIENT = .8901
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.18   SUBAREA RUNOFF(CFS) =    0.58
  TOTAL AREA(ACRES) =        1.3   TOTAL RUNOFF(CFS) =       4.40
  TC(MIN.) =    9.90

+--------------------------------------------------------------------------+
| BASIN 1400 - 100-YEAR STORM                                              |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE   1400.00 TO NODE   1402.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   275.00
  UPSTREAM ELEVATION(FEET) =   1103.00
  DOWNSTREAM ELEVATION(FEET) =   1101.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  TC = 0.303*[(  275.00**3)/(     2.00)]**.2 =    7.673
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.997
  USER-SPECIFIED RUNOFF COEFFICIENT = .8910
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.53
  TOTAL AREA(ACRES) =      0.15   TOTAL RUNOFF(CFS) =      0.53
```

```
****************************************************************************
  FLOW PROCESS FROM NODE   1402.00 TO NODE   1404.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1101.00  DOWNSTREAM ELEVATION(FEET) = 1084.00
  STREET LENGTH(FEET) =   638.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 15.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0180
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.00
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.22
    HALFSTREET FLOOD WIDTH(FEET) =    5.90
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.31
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.51
  STREET FLOW TRAVEL TIME(MIN.) =   4.60   Tc(MIN.) =   12.28
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.287
  USER-SPECIFIED RUNOFF COEFFICIENT = .8893
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.32      SUBAREA RUNOFF(CFS) =    0.94
  TOTAL AREA(ACRES) =        0.5        PEAK FLOW RATE(CFS) =       1.47

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.25   HALFSTREET FLOOD WIDTH(FEET) =   7.07
  FLOW VELOCITY(FEET/SEC.) =  2.51   DEPTH*VELOCITY(FT*FT/SEC.) =   0.62
  LONGEST FLOWPATH FROM NODE   1400.00 TO NODE   1404.00 =     913.00 FEET.

+--------------------------------------------------------------------------+
| BASIN 1500 - 100-YEAR STORM                                              |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE   1500.00 TO NODE   1502.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
```

```
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   254.30
  UPSTREAM ELEVATION(FEET) =   1103.00
  DOWNSTREAM ELEVATION(FEET) =   1101.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  TC = 0.303*[(  254.30**3)/(     2.00)]**.2 =    7.321
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.075
  USER-SPECIFIED RUNOFF COEFFICIENT = .8911
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.94
  TOTAL AREA(ACRES) =      0.26   TOTAL RUNOFF(CFS) =      0.94

****************************************************************************
  FLOW PROCESS FROM NODE   1502.00 TO NODE   1504.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1101.00  DOWNSTREAM ELEVATION(FEET) = 1084.00
  STREET LENGTH(FEET) =   672.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.04
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.29
    HALFSTREET FLOOD WIDTH(FEET) =    7.22
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.09
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.90
  STREET FLOW TRAVEL TIME(MIN.) =   3.63   Tc(MIN.) =   10.95
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.448
  USER-SPECIFIED RUNOFF COEFFICIENT = .8897
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.71      SUBAREA RUNOFF(CFS) =    2.18
  TOTAL AREA(ACRES) =        1.0        PEAK FLOW RATE(CFS) =       3.12

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =   9.09
  FLOW VELOCITY(FEET/SEC.) =  3.35   DEPTH*VELOCITY(FT*FT/SEC.) =   1.09
  LONGEST FLOWPATH FROM NODE   1500.00 TO NODE   1504.00 =     926.30 FEET.

+----------------------------------------------------------------------------+
```

```
| BASIN 1600 - 100-YEAR STORM                                                |
|                                                                            |
|                                                                            |
+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE   1600.00 TO NODE   1602.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   221.00
  UPSTREAM ELEVATION(FEET) =   1103.00
  DOWNSTREAM ELEVATION(FEET) =   1099.00
  ELEVATION DIFFERENCE(FEET) =      4.00
  TC = 0.303*[(  221.00**3)/(     4.00)]**.2 =    5.859
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.471
  USER-SPECIFIED RUNOFF COEFFICIENT = .8919
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.56
  TOTAL AREA(ACRES) =      0.14   TOTAL RUNOFF(CFS) =      0.56

+----------------------------------------------------------------------------+
| BASIN 1700 - 100-YEAR STORM                                                |
|                                                                            |
|                                                                            |
+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE   1700.00 TO NODE   1702.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   224.00
  UPSTREAM ELEVATION(FEET) =   1103.00
  DOWNSTREAM ELEVATION(FEET) =   1099.00
  ELEVATION DIFFERENCE(FEET) =      4.00
  TC = 0.303*[(  224.00**3)/(     4.00)]**.2 =    5.906
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.456
  USER-SPECIFIED RUNOFF COEFFICIENT = .8918
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.95
  TOTAL AREA(ACRES) =      0.24   TOTAL RUNOFF(CFS) =      0.95
============================================================================
  END OF STUDY SUMMARY:
```

```
  TOTAL AREA(ACRES)     =         0.2  TC(MIN.) =      5.91
  PEAK FLOW RATE(CFS)   =       0.95
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

Appendix D

Preliminary Inlet Calculations

Worksheet for Curb Inlet In Sag - Basin 600

Project Description

Solve For	Curb Opening Length

Input Data

Discharge		6.30	ft³/s
Spread		12.00	ft
Gutter Width		2.00	ft
Gutter Cross Slope		0.02	ft/ft
Road Cross Slope		0.02	ft/ft
Opening Height		0.50	ft
Curb Throat Type	Inclined		
Local Depression		4.00	in
Local Depression Width		2.00	ft
Throat Incline Angle		30.00	degrees

Results

Curb Opening Length	19.70	ft
Depth	0.24	ft
Gutter Depression	0.00	ft
Total Depression	0.33	ft

Worksheet for Curb Inlet In Sag - Basin 700

Project Description

Solve For	Curb Opening Length

Input Data

Discharge		5.80	ft³/s
Spread		12.00	ft
Gutter Width		2.00	ft
Gutter Cross Slope		0.02	ft/ft
Road Cross Slope		0.02	ft/ft
Opening Height		0.50	ft
Curb Throat Type	Inclined		
Local Depression		4.00	in
Local Depression Width		2.00	ft
Throat Incline Angle		30.00	degrees

Results

Curb Opening Length	17.85	ft
Depth	0.24	ft
Gutter Depression	0.00	ft
Total Depression	0.33	ft

Worksheet for Curb Inlet In Sag - Basin 800

Project Description

Solve For	Curb Opening Length

Input Data

Discharge		3.10	ft^3/s
Spread		12.00	ft
Gutter Width		2.00	ft
Gutter Cross Slope		0.02	ft/ft
Road Cross Slope		0.02	ft/ft
Opening Height		0.50	ft
Curb Throat Type	Inclined		
Local Depression		4.00	in
Local Depression Width		2.00	ft
Throat Incline Angle		30.00	degrees

Results

Curb Opening Length	7.86	ft
Depth	0.24	ft
Gutter Depression	0.00	ft
Total Depression	0.33	ft

Worksheet for Curb Inlet In Sag - Basin 900

Project Description

Solve For	Curb Opening Length

Input Data

Discharge		4.40	ft^3/s
Spread		12.00	ft
Gutter Width		2.00	ft
Gutter Cross Slope		0.02	ft/ft
Road Cross Slope		0.02	ft/ft
Opening Height		0.50	ft
Curb Throat Type	Inclined		
Local Depression		4.00	in
Local Depression Width		2.00	ft
Throat Incline Angle		30.00	degrees

Results

Curb Opening Length	12.67	ft
Depth	0.24	ft
Gutter Depression	0.00	ft
Total Depression	0.33	ft

Worksheet for Curb Inlet On Grade - Basin 1000

Project Description

Solve For	Curb Opening Length

Input Data

Discharge	4.50	ft³/s
Slope	0.03000	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Efficiency	100.00	%
Local Depression	4.00	in
Local Depression Width	2.00	ft

Results

Curb Opening Length	20.19	ft
Intercepted Flow	4.50	ft³/s
Bypass Flow	0.00	ft³/s
Spread	10.07	ft
Depth	0.20	ft
Flow Area	1.01	ft²
Gutter Depression	0.00	ft
Total Depression	0.33	ft
Velocity	4.44	ft/s
Equivalent Cross Slope	0.09435	ft/ft
Length Factor	1.00	
Total Interception Length	20.19	ft

Worksheet for Curb Inlet On Grade - Basin 1100

Project Description

Solve For	Curb Opening Length

Input Data

Discharge	3.80	ft³/s
Slope	0.03000	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Efficiency	100.00	%
Local Depression	4.00	in
Local Depression Width	2.00	ft

Results

Curb Opening Length	18.35	ft
Intercepted Flow	3.80	ft³/s
Bypass Flow	0.00	ft³/s
Spread	9.45	ft
Depth	0.19	ft
Flow Area	0.89	ft²
Gutter Depression	0.00	ft
Total Depression	0.33	ft
Velocity	4.26	ft/s
Equivalent Cross Slope	0.09829	ft/ft
Length Factor	1.00	
Total Interception Length	18.35	ft

Worksheet for Curb Inlet In Sag - Basin 1200

Project Description

Solve For	Curb Opening Length

Input Data

Discharge		3.30	ft^3/s
Spread		12.00	ft
Gutter Width		2.00	ft
Gutter Cross Slope		0.02	ft/ft
Road Cross Slope		0.02	ft/ft
Opening Height		0.50	ft
Curb Throat Type	Inclined		
Local Depression		4.00	in
Local Depression Width		2.00	ft
Throat Incline Angle		30.00	degrees

Results

Curb Opening Length	8.60	ft
Depth	0.24	ft
Gutter Depression	0.00	ft
Total Depression	0.33	ft

Worksheet for Curb Inlet In Sag - Basin 1300

Project Description

Solve For	Curb Opening Length

Input Data

Discharge		3.80	ft³/s
Spread		12.00	ft
Gutter Width		2.00	ft
Gutter Cross Slope		0.02	ft/ft
Road Cross Slope		0.02	ft/ft
Opening Height		0.50	ft
Curb Throat Type	Inclined		
Local Depression		4.00	in
Local Depression Width		2.00	ft
Throat Incline Angle		30.00	degrees

Results

Curb Opening Length	10.45	ft
Depth	0.24	ft
Gutter Depression	0.00	ft
Total Depression	0.33	ft

Worksheet for Curb Inlet On Grade - Basin 1400

Project Description

Solve For	Curb Opening Length

Input Data

Discharge	1.50	ft³/s
Slope	0.03000	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Efficiency	100.00	%
Local Depression	4.00	in
Local Depression Width	2.00	ft

Results

Curb Opening Length	10.89	ft
Intercepted Flow	1.50	ft³/s
Bypass Flow	0.00	ft³/s
Spread	6.67	ft
Depth	0.13	ft
Flow Area	0.44	ft²
Gutter Depression	0.00	ft
Total Depression	0.33	ft
Velocity	3.38	ft/s
Equivalent Cross Slope	0.12229	ft/ft
Length Factor	1.00	
Total Interception Length	10.89	ft

Worksheet for Curb Inlet On Grade - Basin 1500

Project Description

Solve For	Curb Opening Length

Input Data

Discharge	3.10	ft³/s
Slope	0.03000	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Efficiency	100.00	%
Local Depression	4.00	in
Local Depression Width	2.00	ft

Results

Curb Opening Length	16.36	ft
Intercepted Flow	3.10	ft³/s
Bypass Flow	0.00	ft³/s
Spread	8.75	ft
Depth	0.18	ft
Flow Area	0.77	ft²
Gutter Depression	0.00	ft
Total Depression	0.33	ft
Velocity	4.05	ft/s
Equivalent Cross Slope	0.10322	ft/ft
Length Factor	1.00	
Total Interception Length	16.36	ft

Worksheet for Curb Inlet On Grade - Basin 1600

Project Description

Solve For	Curb Opening Length

Input Data

Discharge	0.60	ft³/s
Slope	0.03000	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Efficiency	100.00	%
Local Depression	4.00	in
Local Depression Width	2.00	ft

Results

Curb Opening Length	6.61	ft
Intercepted Flow	0.60	ft³/s
Bypass Flow	0.00	ft³/s
Spread	4.73	ft
Depth	0.09	ft
Flow Area	0.22	ft²
Gutter Depression	0.00	ft
Total Depression	0.33	ft
Velocity	2.68	ft/s
Equivalent Cross Slope	0.14821	ft/ft
Length Factor	1.00	
Total Interception Length	6.61	ft

Worksheet for Curb Inlet On Grade - Basin 1700

Project Description

Solve For	Curb Opening Length

Input Data

Discharge	0.95	ft³/s
Slope	0.03000	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.02	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Efficiency	100.00	%
Local Depression	4.00	in
Local Depression Width	2.00	ft

Results

Curb Opening Length	8.47	ft
Intercepted Flow	0.95	ft³/s
Bypass Flow	0.00	ft³/s
Spread	5.62	ft
Depth	0.11	ft
Flow Area	0.32	ft²
Gutter Depression	0.00	ft
Total Depression	0.33	ft
Velocity	3.01	ft/s
Equivalent Cross Slope	0.13513	ft/ft
Length Factor	1.00	
Total Interception Length	8.47	ft

Appendix E

Preliminary Storm Drain Calculations

Madison Avenue Improvements
J-18099
March 6, 2024

Preliminary Storm Drain Size

The purpose of this table is to provide an estimated pipe size to convey the 100-year flow rates with a sizing factor.

Manning's n: 0.013

Sizing Factor (%): 30

			Slope at:	0.5%		1.0%		2.0%		3% and greater 3.0%		
Node #	**Q_{100} (cfs[1])**	**Q_{100} with Sizing Factor (cfs[1])**		**Minimum Pipe Size[2] (feet)**	**Minimum Pipe Size (inches)**	**Minimum Pipe Size[2] (feet)**	**Minimum Pipe Size (inches)**	**Minimum Pipe Size[2] (feet)**	**Minimum Pipe Size (inches)**	**Minimum Pipe Size[2] (feet)**	**Minimum Pipe Size (inches)**	**Final Recommended Pipe Size (inches)**
600	6.3	8.1		1.55	24"	1.36	18"	1.20	18"	1.11	18"	18"
700	5.8	7.6		1.51	18"	1.32	18"	1.16	18"	1.08	18"	18"
800	3.1	4.1		1.20	18"	1.05	18"	0.92	12"	0.85	12"	18"
900	4.4	5.7		1.36	18"	1.19	18"	1.05	18"	0.97	12"	18"
1000	4.5	5.9		1.37	18"	1.21	18"	1.06	18"	0.98	12"	18"
1100	3.8	4.9		1.28	18"	1.12	18"	0.99	12"	0.91	12"	18"
1200	3.3	4.2		1.21	18"	1.07	18"	0.94	12"	0.87	12"	18"
1300	3.8	5.0		1.29	18"	1.13	18"	0.99	12"	0.92	12"	18"
1400	1.5	1.9		0.90	12"	0.79	10"	0.69	10"	0.64	8"	18"
1500	2.7	3.5		1.13	18"	0.99	12"	0.87	12"	0.81	10"	18"
1600	0.6	0.7		0.63	8"	0.55	8"	0.48	6"	0.45	6"	18"
1700	0.9	1.1		0.73	10"	0.64	8"	0.57	8"	0.52	8"	18"

Note:

1. "cfs" = cubic feet per second.
2. Minimum pipe sizes are calculated using the Manning's equation and are based on the flow rates with 30% factor.

Appendix F

Preliminary Culvert Calculations

Madison Ave. Street Improvements
18099
July 23, 2018

Preliminary Storm Drain Size

The purpose of this table is to provide an estimated pipe size to convey the 100-year flow rates with a sizing factor.

Manning's n: 0.013

Sizing Factor (%): 30

Slope at:		0.5%		1.0%		2.0%		3.0%	
Q_{100} (cfs[1])	Q_{100} with Sizing Factor (cfs[1])	Minimum Pipe Size[2] (feet)	Recommended Pipe Size (inches)	Minimum Pipe Size[2] (feet)	Recommended Pipe Size (inches)	Minimum Pipe Size[2] (feet)	Recommended Pipe Size (inches)	Minimum Pipe Size[2] (feet)	Recommended Pipe Size (inches)
1.0	1.3	0.78	10"	0.68	10"	0.60	8"	0.56	8"
2.0	2.6	1.01	12"	0.89	12"	0.78	10"	0.72	10"
2.4	3.1	1.08	18"	0.95	12"	0.83	10"	0.77	10"
10.0	13.0	1.85	24"	1.62	24"	1.43	18"	1.32	18"
15.0	19.5	2.15	30"	1.89	24"	1.66	24"	1.54	24"
20.0	26.0	2.40	30"	2.11	30"	1.85	24"	1.71	24"
24.6	31.9	2.59	36"	2.27	30"	2.00	24"	1.85	24"
30.0	39.0	2.79	36"	2.45	30"	2.15	30"	1.99	24"
35.0	45.5	2.96	36"	2.60	36"	2.28	30"	2.11	30"
40.0	52.0	3.11	42"	2.73	36"	2.40	30"	2.22	30"
50.0	65.0	3.38	42"	2.97	36"	2.61	36"	2.42	30"
60.0	78.0	3.62	48"	3.18	42"	2.79	36"	2.59	36"
70.0	91.0	3.83	48"	3.37	42"	2.96	36"	2.74	36"
80.0	104.0	4.03	54"	3.54	48"	3.11	42"	2.88	36"
90.0	117.0	4.21	54"	3.70	48"	3.25	42"	3.01	42"
110.0	143.0	4.54	60"	3.99	48"	3.50	42"	3.25	42"
145.0	188.5	5.04	72"	4.42	54"	3.89	48"	3.60	48"
170.0	221.0	5.35	72"	4.70	60"	4.12	54"	3.82	48"
240.0	312.0	6.09	84"	5.35	72"	4.69	60"	4.35	54"
350.0	455.0	7.01	96"	6.16	84"	5.41	72"	5.01	72"

maybe 18"

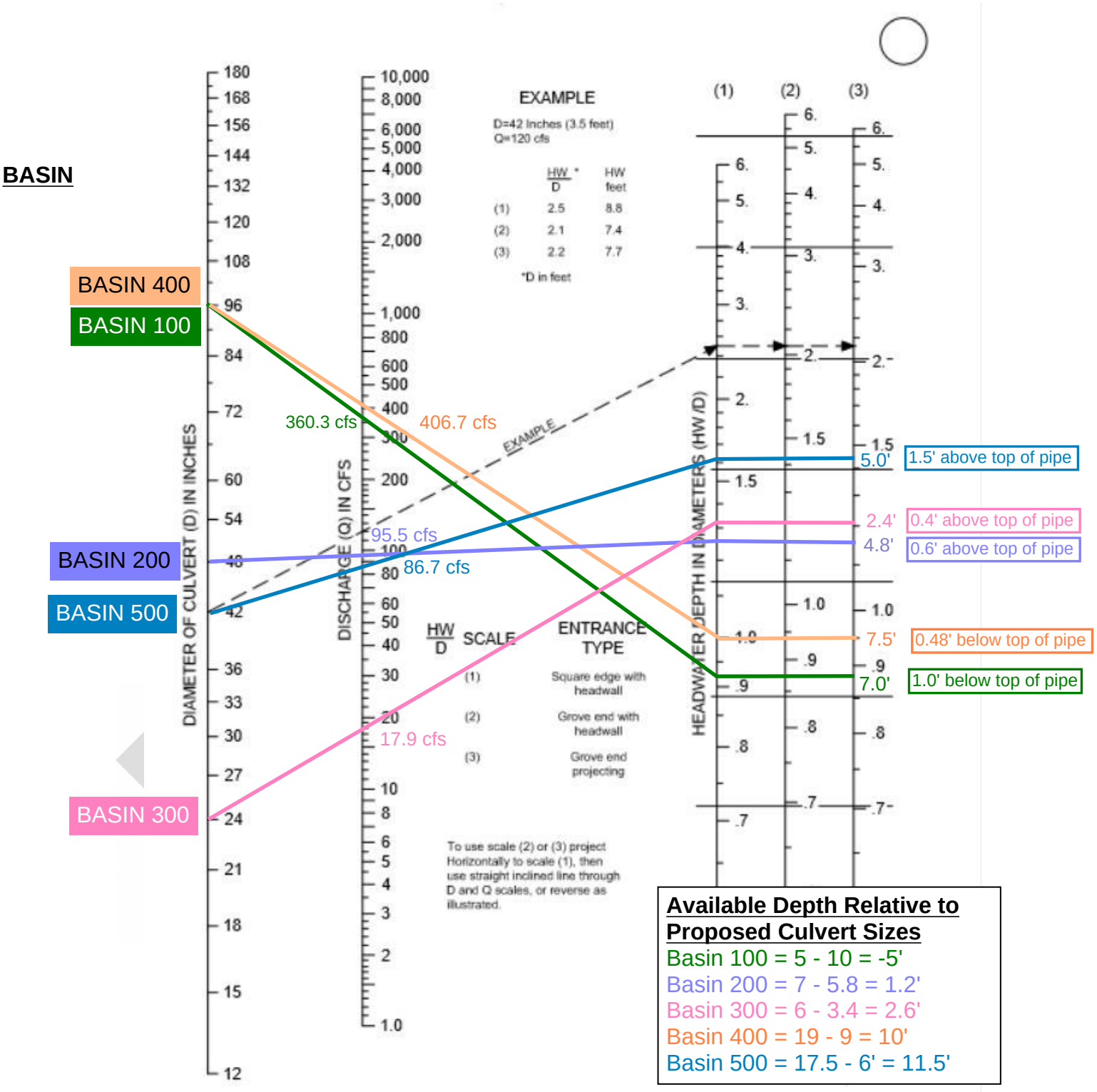
Note:

1. "cfs" = cubic feet per second.
2. Minimum pipe sizes are calculated using the Manning's equation and are based on the flow rates with 30% factor.

* Based on 2035 land use by City of Murrieta

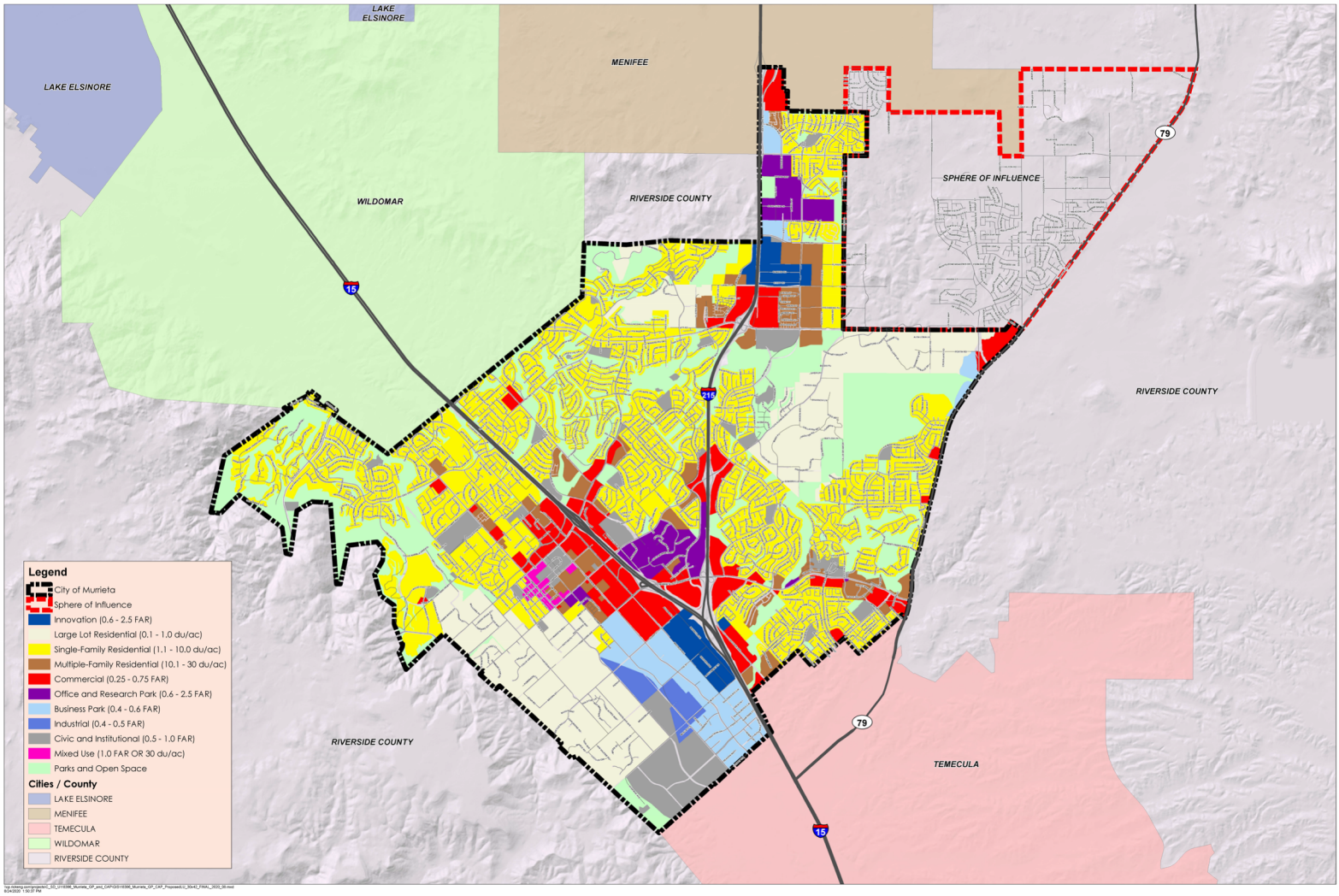
BASIN	Q_{100} (cfs) @ Madison Ave.	Area (ac)	Q_{100}/A (cfs/ac)
100	360.3	157.5	2.3
200	95.5	43.1	2.2
300	17.9	4.8	3.7
400	406.7	165.9	2.5
500	86.7	41.7	2.1

Figure 6.18: Inlet Control Headwater Depth for Concrete Pipe Culverts
(USDOT, FHWA, HDS-5, Chart 1B, 2012)



Note: In example, culvert diameter and discharge are known and solving for headwater depth.

Insert Exhibit 3-4 General Plan 2035 Land Use Policy Map



RICK ENGINEERING COMPANY www.rickengineering.com

Scale in Feet 0 2,400 4,800 7,200 North

Date of Exhibit: 08/22/2016
ESRI World Imagery Basemap: 06/04/2015

General Plan 2035 Land Use Policy Map - FINAL

Exhibit 3-4

Map Pocket 1

Drainage Study Map, Off-site

LEGEND

DRAINAGE BASIN BOUNDARY

DRAINAGE BASIN BOUNDARY

BASIN XXX — DRAINAGE BASIN ID

XX.X AC. — DRAINAGE AREA

XXX — DRAINAGE NODE

PRELIMINARY DRAINAGE STUDY EXHIBIT FOR MADISON AVE

Date: July 17, 2018

100 0.2 AC. 102 4.5 AC. 8.3 AC. 105 111 0.2 AC. 112 7.6 AC. 109 113 17.9 AC. 120 0.1 AC. 122 3.8 AC. 4.6 AC. 110 123 115 5.2 AC. 12.7 AC. 117 0.3 AC. 125 9.4 AC. 130 0.1 AC. 132 4.2 AC. 6.9 AC. 0.1 AC. 0.7 AC. 127 140 142 145 135 200 202 2.5 AC. 137 139 1.7 AC. 129 147 12.1 AC. 6.5 AC. 150 7.7 AC. 18.7 AC. 160 5.2 AC. 165 BASIN 100 16.3 AC. 170

400 0.2 AC. 402 8.2 AC. 405 22.9 AC. 410 10.0 AC. 440 0.2 AC. 442 2.2 AC. 420 8.9 AC. 9.2 AC. 443 15.9 AC. 430 2.5 AC. 445 3.1 AC. 447 435 3.2 AC. 0.2 AC. 210 3.1 AC. 220 16.7 AC. 449 7.7 AC. 223 5.2 AC. 226 8.3 AC. 5.3 AC. 230 BASIN 200 13.3 AC. 240

0.2 AC. 460 0.3 AC. 500 502 1.6 AC. 505 462 0.6 AC. 465 467 437 450 4.2 AC. 510 5.4 AC. 3.8 AC. 32.5 AC. 470 10.2 AC. 4.8 AC. 6.2 AC. 520 0.1 AC. 302 300 BASIN 400 480 5.7 AC. 6.7 AC. BASIN 500 14.0 AC. 530 4.7 AC. BASIN 300 310 490 8.2 AC. 540

MAIN CROSS CREEK

GOLDEN GATE DR.

ELM ST.

MADISON AVE.

MADISON AVE.

MADISON AVE.

GRAPHIC SCALE 1" = 200'

200 100 0 200 400 600

RICK ENGINEERING COMPANY
San Diego
5620 FRIARS ROAD
SAN DIEGO, CA 92110
619-291-0707
(FAX) 619-291-4165
rickengineering.com
Riverside - Orange - Sacramento - San Luis Obispo - Phoenix - Tucson - Denver

J-18099

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7-14-2018 1:10:00

NOT FOR CONSTRUCTION - EXHIBIT FOR DRAINAGE STUDY ONLY

Map Pocket 2

Drainage Study Map, On-site

GUAVA STREET

0.62 AC

38 39 40 41 42 43 44 45 46 47 48 49

BASIN 600

BASIN 700

0.55 AC

0.81 AC

0.76 AC

0.35 AC

0.27 AC

PRIVATE DRIVE

PRIVATE DRIVE

MADISON AVENUE

MADISON AVENUE

MATCHLINE STA. 49+50
SEE BELOW

NEWTON AZRAK STREET

SEE ABOVE
MATCHLINE STA. 49+50

JORDAN LANE

0.30 AC

50 51 52 53 54 55 56 57 58 59 60 61

BASIN 800

BASIN 900

BASIN 1000

BASIN 1100

0.37 AC

0.60 AC

0.34 AC

0.19 AC

MADISON AVENUE

MATCHLINE STA. 62+00
SEE SHEET NO. 2

LEGEND

- DRAINAGE BOUNDARY (MAJOR)
- DRAINAGE BOUNDARY (MINOR)
- FLOW PATH
- SURFACE DRAINAGE DIRECTION
- PROPOSED IMPERVIOUS AREA
- 101 DRAINAGE NODE
- 0.25 AC DRAINAGE AREA
- 75 EXIST. MAJOR ELEV. CONTOUR
- 74 EXIST. MINOR ELEV. CONTOUR
- 75 PROP. MAJOR ELEV. CONTOUR
- 74 PROP. MINOR ELEV. CONTOUR

NOT FOR CONSTRUCTION - FOR DRAINAGE STUDY ONLY

40 20 0 40 80
GRAPHIC SCALE: 1"=40'

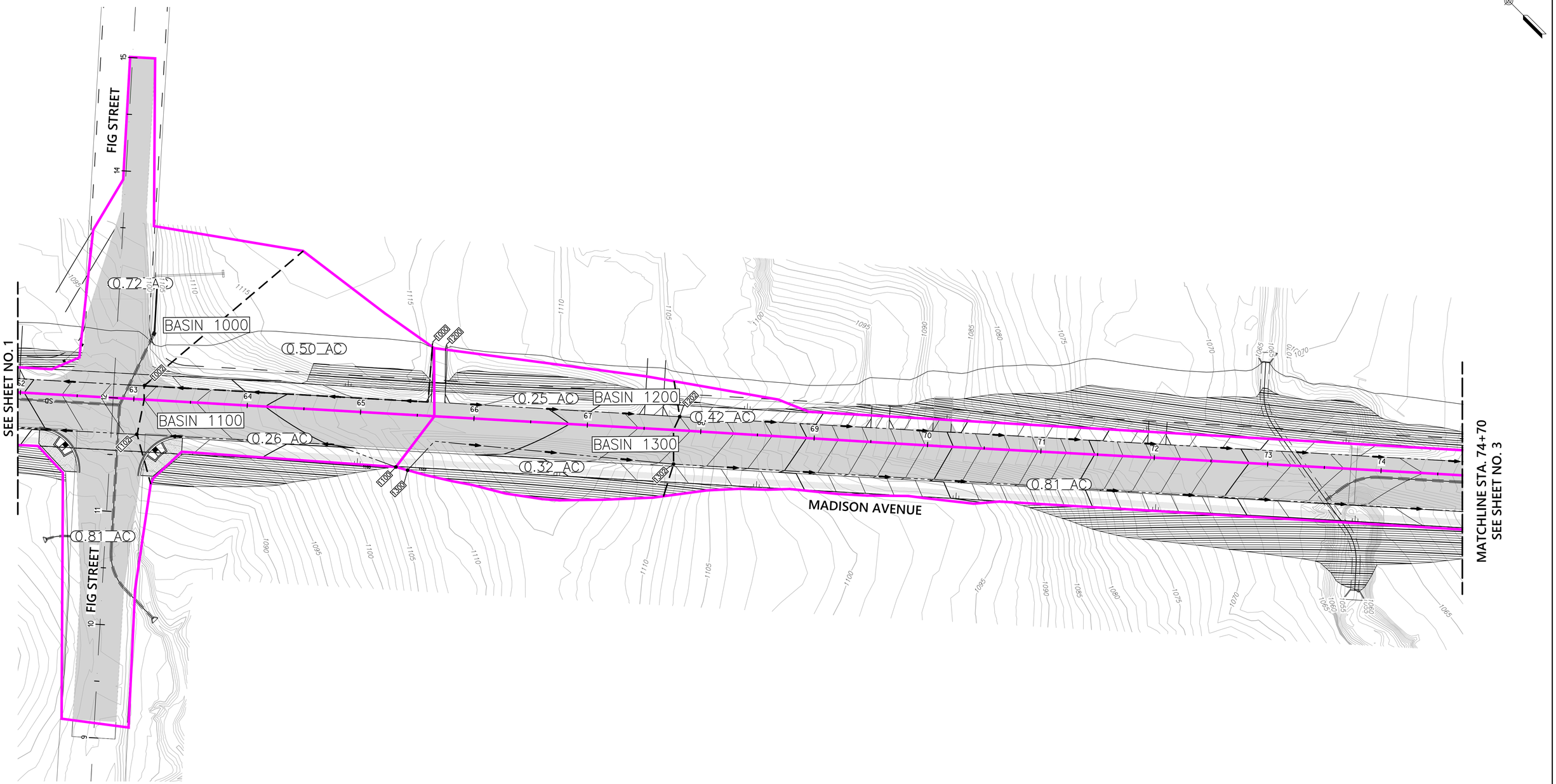
RICK ENGINEERING COMPANY
5620 FRIARS ROAD
SAN DIEGO, CA 92110
619.291.0707
rickengineering.com

MURRIETA MADISON AVENUE

POST-PROJECT DRAINAGE EXHIBIT

PROJECT NO:	18099	SCALE:	1"=40'
DRAWN BY:	KO	DATE:	3/4/2024

\\cp.rickeng.com\projects\C_ORN_Q\18099_Murrieta_Madison_Ave\WaterResources\18099_drn_post1.dwg – plotted by: kotsuka ON 2024-03-04 @ 17:25 – ctb:rec_ncs_v2.ctb – © 2024 Rick Engineering Company



LEGEND

- DRAINAGE BOUNDARY (MAJOR)
- DRAINAGE BOUNDARY (MINOR)
- FLOW PATH
- SURFACE DRAINAGE DIRECTION
- PROPOSED IMPERVIOUS AREA
- 101 — DRAINAGE NODE
- 0.25 AC — DRAINAGE AREA
- 75 — EXIST. MAJOR ELEV. CONTOUR
- 74 — EXIST. MINOR ELEV. CONTOUR
- 75 — PROP. MAJOR ELEV. CONTOUR
- 74 — PROP. MINOR ELEV. CONTOUR

NOT FOR CONSTRUCTION - FOR DRAINAGE STUDY ONLY

40 20 0 40 80
GRAPHIC SCALE: 1"=40'

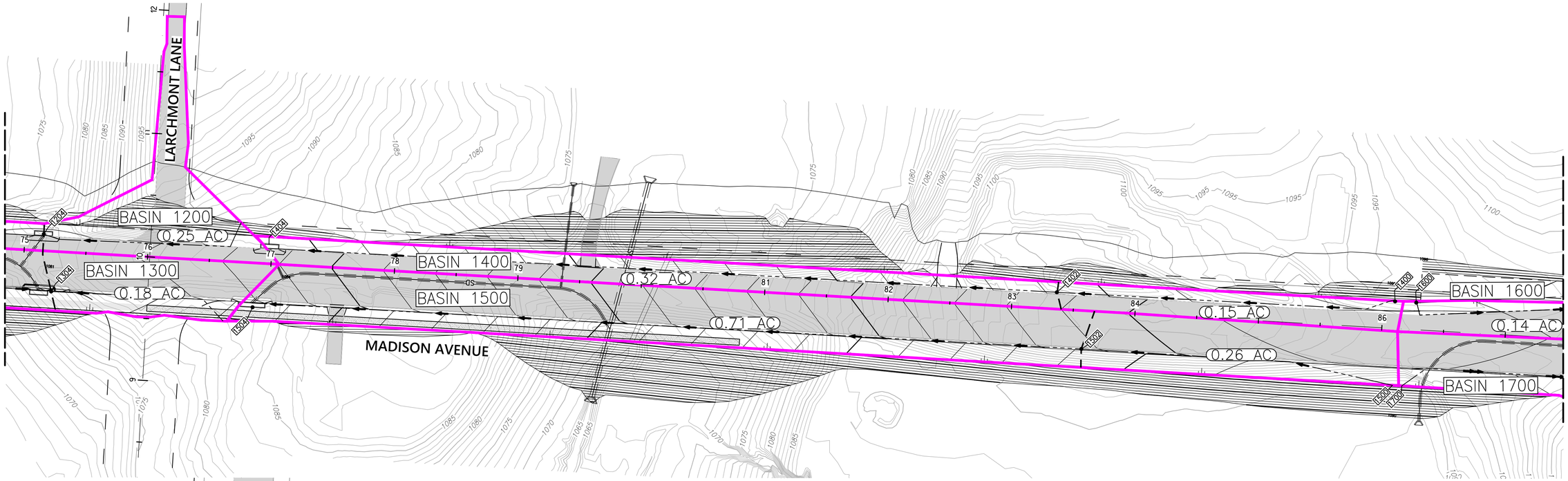
RICK ENGINEERING COMPANY
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SAN DIEGO, CA 92110
619.291.0707
rickengineering.com

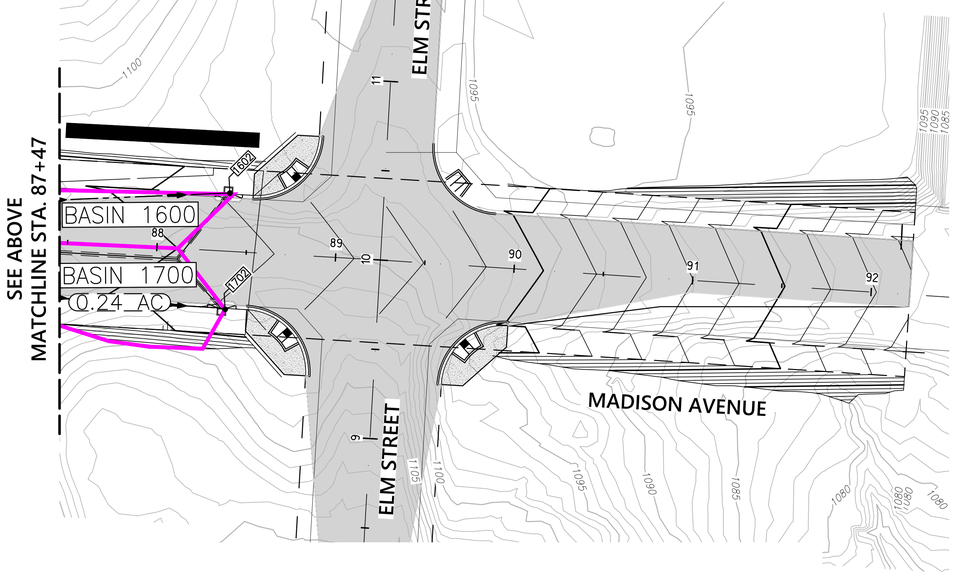
MURRIETA MADISON AVENUE

POST-PROJECT DRAINAGE EXHIBIT

PROJECT NO:	18099	SCALE:	1"=40'
DRAWN BY:	KO	DATE:	3/4/2024

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LEGEND

- DRAINAGE BOUNDARY (MAJOR)
- DRAINAGE BOUNDARY (MINOR)
- FLOW PATH
- SURFACE DRAINAGE DIRECTION
- PROPOSED IMPERVIOUS AREA
- 101 DRAINAGE NODE
- 0.25 AC DRAINAGE AREA
- 75 EXIST. MAJOR ELEV. CONTOUR
- 74 EXIST. MINOR ELEV. CONTOUR
- 75 PROP. MAJOR ELEV. CONTOUR
- 74 PROP. MINOR ELEV. CONTOUR

NOT FOR CONSTRUCTION - FOR DRAINAGE STUDY ONLY

40 20 0 40 80
GRAPHIC SCALE: 1"=40'

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MURRIETA MADISON AVENUE

POST-PROJECT DRAINAGE EXHIBIT

PROJECT NO:	18099	SCALE:	1"=40'
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