ONPOINT Oceanside

Preliminary Drainage Report

CITY OF OCEANSIDE
3306 SENIOR CENTER DRIVE
OCEANSIDE, CA 92054

DECEMBER 14, 2018 | VERSION 2

Prepared By:

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Kimley»Horn

This Drainage Study has been prepared by Kimley-Horn and Associates, Inc. under the direct supervision of the following Registered Civil Engineer. The undersigned attests to the technical data contained in this study, and to the qualifications of technical specialists providing engineering computations upon which the recommendations and conclusions are based.

_____ _____

Shea-Michael Anti R.C.E. 78274 Date

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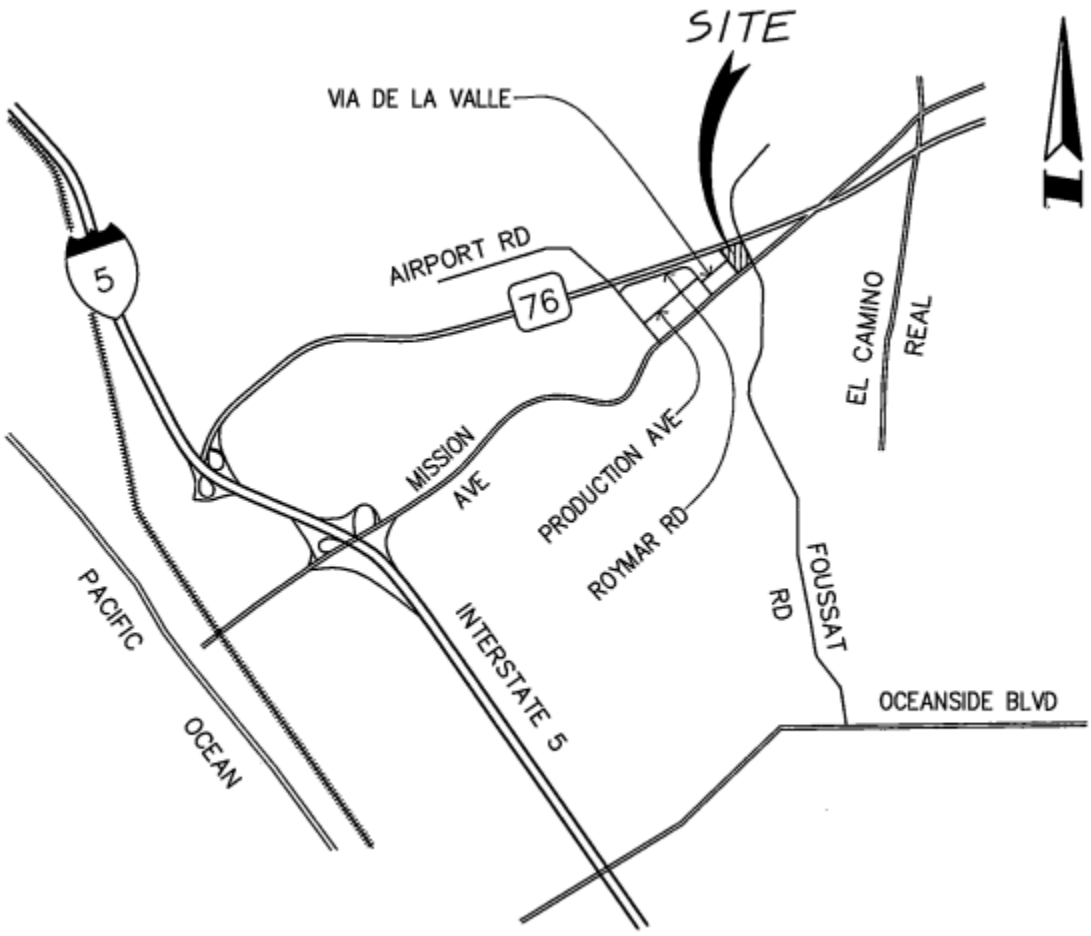
Figure 1 Vicinity Map



1 INTRODUCTION

This Drainage Report has been prepared for the City of Oceanside to document the engineering analysis used in the drainage evaluation and design for the proposed ONPOINT Oceanside in Oceanside, CA. The project site is located at North West Corner of Intersection of Mission Ave and Foussat Rd. See **Figure 1** for vicinity map.

The developer is proposing to construct a new mixed use commercial development on the 3.728 ac site. The site has previously been mass-graded and is currently undeveloped.

The development will include seven (7) proposed buildings, one fueling island and various landscape areas. The site will also include sidewalks, landscaping and underground infiltration basins.

2 PROCEDURE AND METHODOLOGIES

Hydrologic calculations were completed using the San Diego County Hydrology Manual. Pertinent excerpts from the manual are included in **Appendix B.** The Rational Method was used to determine the peak discharge for the proposed improvements. This formula is expressed as:

$$\mathbf{Q = CIA}$$

Q= peak discharge (cfs)
C= runoff coefficient
I= intensity (in/hr)
A= area (acres)

Runoff coefficients are based on land use and soil type B for the project. Rainfall intensity is based on the selected storm frequency, 6-hour storm rainfall amount, and duration. The rainfall intensity equation is as follows:

$$\mathbf{I = 7.44P_6D^{-0.645}}$$

I=Intensity (in/hr)
P_6=6-Hour Precipitation (in)
D= Duration (min)

P_6 was determined using San Diego County Hydrology Manual's Isopluvial maps for each frequency storm. Duration is equal to the Time of Concentration (T_c) for a selected storm frequency; Tc = 5 min was used for all drainage basins for this project due to the small areas delineated.

Per the City of Oceanside SUSMP dated March 2010, peak flow rates were calculated for the 2, 10, and 100-year storm.

Runoff coefficients are based on land use and soil type B for this project. For the existing conditions, a runoff coefficient of 0.67 was used for the native grade area. For the proposed conditions, a runoff coefficient of 0.85 was used due to the use determination as general commercial. The runoff coefficients were determined using the AES modeling software and guidance from Table 3-1 in the San Diego County Hydrology Manual.

3 EXISTING DRAINAGE

The site is bounded by an existing development to the south west, Mission Ave the south east, Foussat Rd to the north east and State Route 76 to the north west.

Stormwater runoff from surrounding offsite areas does not enter the proposed project site. The site is bounded on three sides by roads/parking with curb and gutter and on the other side by vegetation. Water sheet flows across the proposed site towards the north corner. An existing stormwater conveyance captures the runoff and outfalls into an existing underground box culvert. The box culvert provides conveyance of the water underneath SR 76 and outlets into open channel on the north side of SR 76. The open channel discharges directly into San Luis Rey River. A small area near the north west side of the property has a cross slope and flows away from the rest of the site towards the existing development along the south west side of the property.

See **Appendix A** for existing hydrology exhibit, which shows the existing drainage areas and flow paths illustrating the direction of offsite flow.

See **Appendix B** for existing hydrology calculations, summarized below:

Table 1 – Existing Hydrology Calculations

Basin	Area (SF)	Q_2 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)
A	149,411	3.78	5.48	8.26
B	13,068	0.67	0.94	1.37

4 PROPOSED DRAINAGE

The proposed development will require a large amount of fill to meet the minimum flood plain requirements. The existing hydrology will be modified to account for new elevations for the proposed buildings and associated hardscaping. The project site is favorable for infiltration and underground infiltration areas will be constructed to meet water quality and hydromodification requirements.

The proposed underground infiltration areas will treat runoff from the majority of the project site. Landscape areas required along the south east and northeast side of the project to satisfy existing easements and city set back requirements will be self-mitigating areas and not require BMP control.

Catch basins throughout the project site will capture all stormwater including water discharged at the surface from roof drains. All stormwater will be directed to the underground infiltration areas to be retained and infiltrated via Stormtech 4500 system. The system has been designed to capture 100% of all stormwater with zero discharge for any storm event up to a 100 year event. In order to provide an additional factor of safety, the system was design for “instantaneous” volume to ensure adequate retention for any event up to a 100 year storm. The factored infiltration rate of 1.4 inch/hr was used to determine the required draw down time for each of the four proposed basins via City of Oceanside Worksheet B.4-1. All four basins adequately drawn down within 36 hours as required per the City of Oceanside Standards. Due to the proposed use of the underground infiltration areas no hydraulic calculations are available at this time.

See **Appendix A** for proposed drainage exhibit, and **Appendix B** for proposed hydrology calculations, summarized below:

Table 2 – Proposed Hydrology Calculations

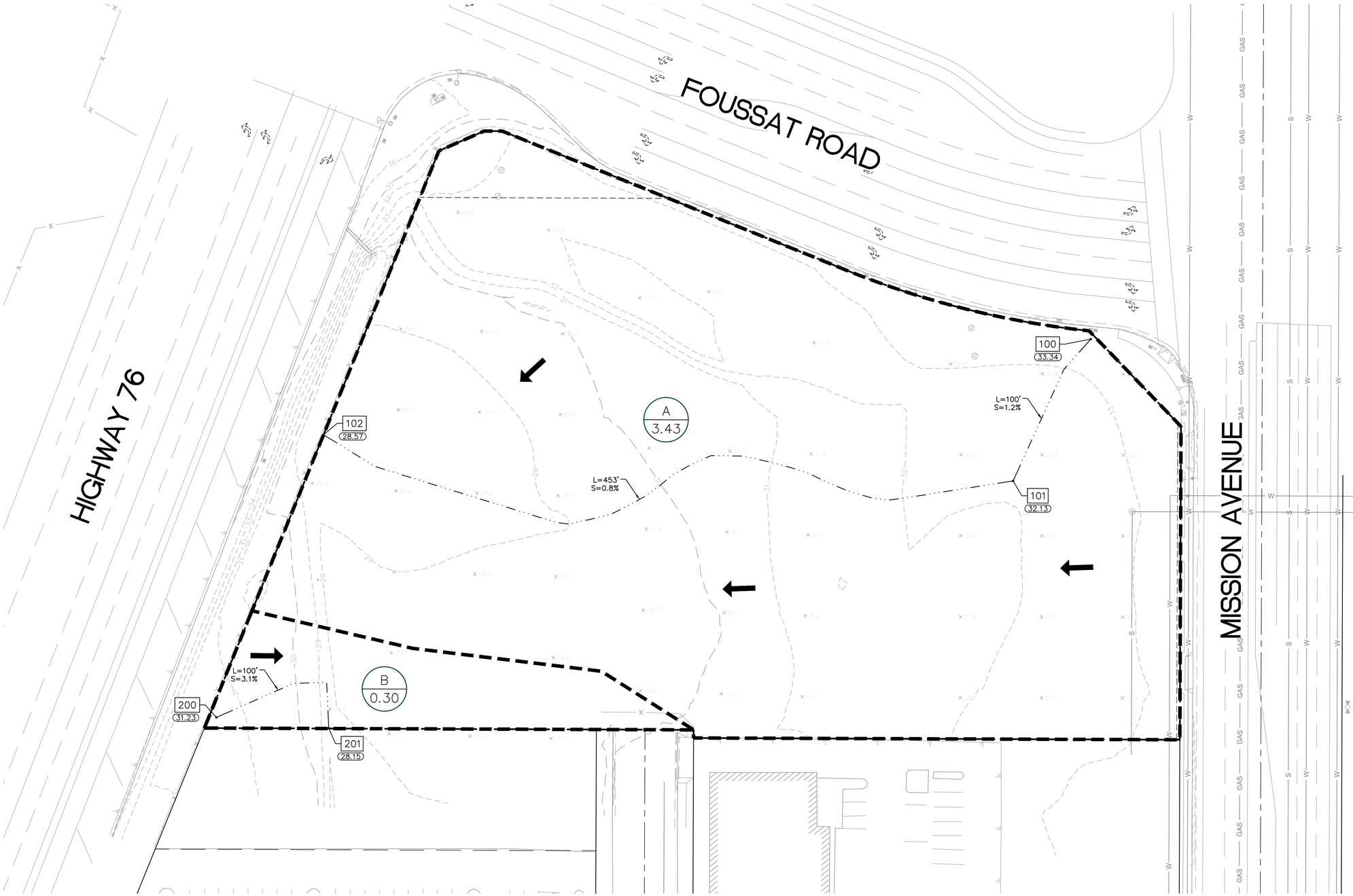
Basin	Area (SF)	Q_2 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)
A	27,000	1.61	2.25	3.35
B	55,758	3.14	4.51	6.59
C	10,033	0.62	0.87	1.26
E	41,483	2.28	3.25	4.82

APPENDICES

APPENDIX A

EXISTING HYDROLOGY EXHIBIT

PROPOSED HYDROLOGY EXHIBIT



LEGEND

- XX / XX — DMA ID / DMA ACREAGE
- XXX — NODE DESIGNATION
- BASIN BOUNDARY
- FLOW DIRECTION
- FLOW PATH
- ??? — NODE ELEVATION (FEET)
- PROPERTY LINE
- CENTERLINE

EXISTING HYDROLOGY CALCULATIONS

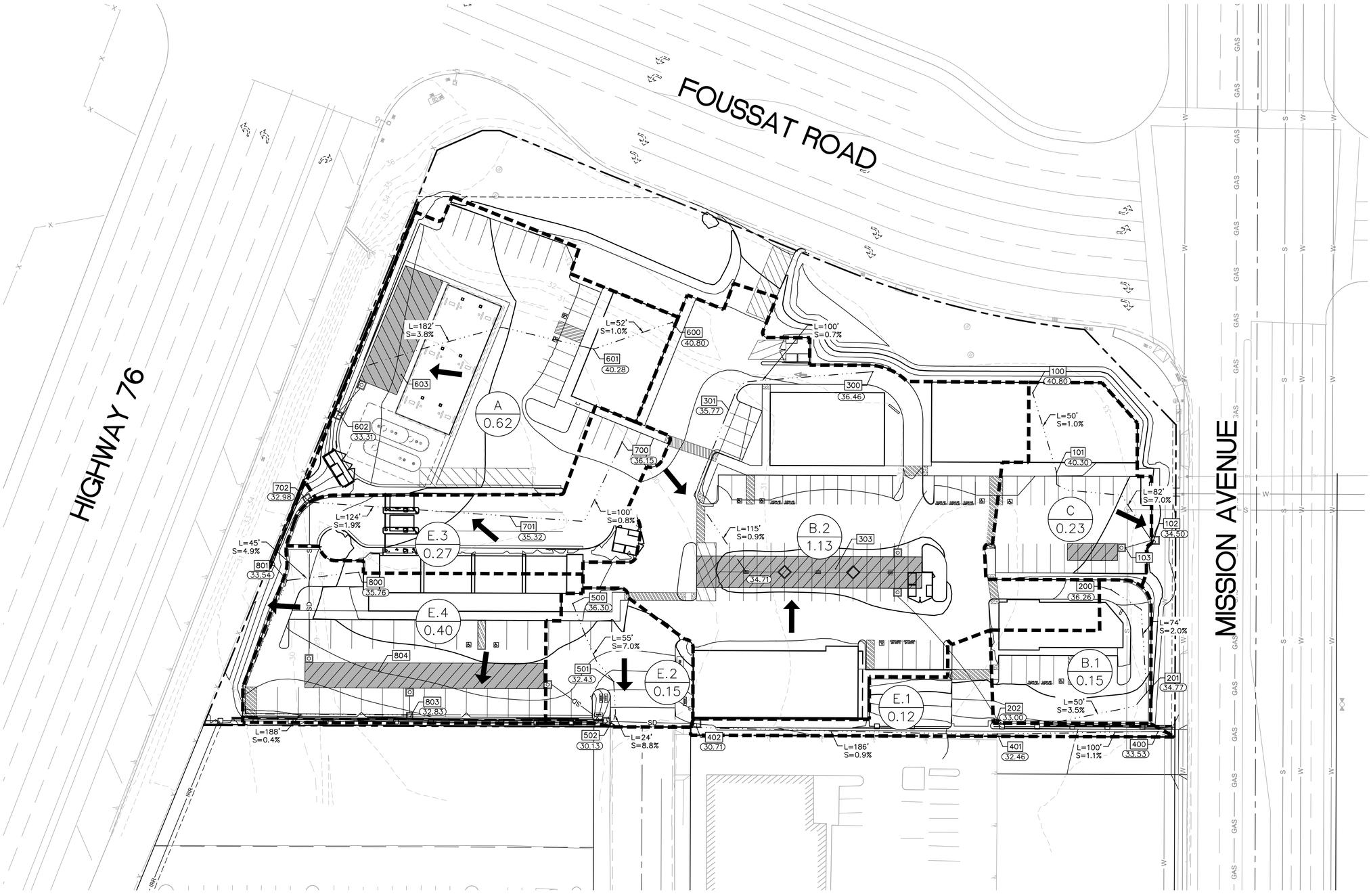
DMA ID	AREA (SF)	Q2 (CFS)	Q10 (CFS)	Q100 (CFS)
A	149,411	3.78	5.48	8.26
B	13,068	0.67	0.94	1.37

NORTH

GRAPHIC SCALE IN FEET
0 15 30 60

Kimley»Horn

EXISTING DRAINAGE EXHIBIT
ONPOINT OCEANSIDE
April 10, 2018



LEGEND

- XX / XX — DMA ID / DMA ACREAGE
- XXX — NODE DESIGNATION
- BASIN BOUNDARY
- FLOW DIRECTION
- FLOW PATH
- ??? — NODE ELEVATION (FEET)
- PROPERTY LINE
- CENTERLINE
- SD — STORM DRAIN

PROPOSED HYDROLOGY CALCULATIONS

DMA ID	AREA (SF)	Q2 (CFS)	Q10 (CFS)	Q100 (CFS)
A	27,000	1.61	2.25	3.35
B.1	6,624	0.40	0.57	0.82
B.2	49,134	2.74	3.94	5.77
C	10,033	0.62	0.87	1.26
E.1	5,435	0.27	0.38	0.55
E.2	6,699	0.40	0.57	0.82
E.3	11,891	0.66	0.94	1.37
E.4	17,458	0.95	1.36	2.08

NORTH

GRAPHIC SCALE IN FEET
0 15 30 60

Kimley»Horn

PROPOSED DRAINAGE EXHIBIT
ONPOINT OCEANSIDE
December 13, 2018

APPENDIX B

EXISTING HYDROLOGY CALCULATIONS

PROPOSED HYDROLOGY CALCULATIONS

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************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2011 Advanced Engineering Software (aes)
              Ver. 18.0 Release Date: 07/01/2011  License ID 1499

                          Analysis prepared by:




 ************************** DESCRIPTION OF STUDY **************************
* ONPOINT OCEANSIDE                                                      *
* 2 YEAR EXISTING RATIONAL METHOD HYDROLOGY                              *
* 3/28/2018 KA                                                           *
 ************************************************************************

  FILE NAME: OPE2.DAT
  TIME/DATE OF STUDY: 08:19 03/29/2018
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =   2.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   1.280
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.    (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

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

************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
========================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .6700
  S.C.S. CURVE NUMBER (AMC II) =  86
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =     33.34
  DOWNSTREAM ELEVATION(FEET) =     32.13
  ELEVATION DIFFERENCE(FEET) =      1.21
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.950
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    67.10
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.015
  SUBAREA RUNOFF(CFS) =      0.20
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.20

************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
```

```
--------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     32.13  DOWNSTREAM(FEET) =     28.57
  CHANNEL LENGTH THRU SUBAREA(FEET) =   453.00   CHANNEL SLOPE =  0.0079
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.644
  USER-SPECIFIED RUNOFF COEFFICIENT = .6700
  S.C.S. CURVE NUMBER (AMC II) =  86
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.14
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.81
  AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   9.28
  Tc(MIN.) =   15.23
  SUBAREA AREA(ACRES) =     3.33       SUBAREA RUNOFF(CFS) =    3.67
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.670
  TOTAL AREA(ACRES) =        3.4         PEAK FLOW RATE(CFS) =       3.78

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.20   FLOW VELOCITY(FEET/SEC.) =   0.94
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     553.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .6700
  S.C.S. CURVE NUMBER (AMC II) =  86
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =     31.23
  DOWNSTREAM ELEVATION(FEET) =     28.15
  ELEVATION DIFFERENCE(FEET) =      3.08
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.053
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    90.20
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.350
  SUBAREA RUNOFF(CFS) =      0.67
  TOTAL AREA(ACRES) =      0.30   TOTAL RUNOFF(CFS) =      0.67
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.3  TC(MIN.) =      5.05
  PEAK FLOW RATE(CFS)   =       0.67
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

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            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
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              Ver. 18.0 Release Date: 07/01/2011  License ID 1499

                          Analysis prepared by:



 ************************** DESCRIPTION OF STUDY **************************
* ONPOINT OCEANSIDE                                                      *
* 10 YEAR EXISTING RATIONAL METHOD HYDROLOGY                             *
* 3/28/2018 KA                                                           *
 ************************************************************************

  FILE NAME: OPE10.DAT
  TIME/DATE OF STUDY: 08:21 03/29/2018
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =  10.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   1.790
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

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

************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
========================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .6700
  S.C.S. CURVE NUMBER (AMC II) =  86
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =     33.34
  DOWNSTREAM ELEVATION(FEET) =     32.13
  ELEVATION DIFFERENCE(FEET) =      1.21
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.950
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    67.10
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.216
  SUBAREA RUNOFF(CFS) =      0.28
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.28

************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
```

```
--------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     32.13  DOWNSTREAM(FEET) =     28.57
  CHANNEL LENGTH THRU SUBAREA(FEET) =   453.00   CHANNEL SLOPE =  0.0079
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.383
  USER-SPECIFIED RUNOFF COEFFICIENT = .6700
  S.C.S. CURVE NUMBER (AMC II) =  86
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.06
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.89
  AVERAGE FLOW DEPTH(FEET) =   0.19   TRAVEL TIME(MIN.) =   8.45
  Tc(MIN.) =   14.40
  SUBAREA AREA(ACRES) =     3.33       SUBAREA RUNOFF(CFS) =    5.32
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.670
  TOTAL AREA(ACRES) =        3.4         PEAK FLOW RATE(CFS) =       5.48

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.23   FLOW VELOCITY(FEET/SEC.) =   1.03
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     553.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .6700
  S.C.S. CURVE NUMBER (AMC II) =  86
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =     31.23
  DOWNSTREAM ELEVATION(FEET) =     28.15
  ELEVATION DIFFERENCE(FEET) =      3.08
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.053
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    90.20
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.684
  SUBAREA RUNOFF(CFS) =      0.94
  TOTAL AREA(ACRES) =      0.30   TOTAL RUNOFF(CFS) =      0.94
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.3  TC(MIN.) =      5.05
  PEAK FLOW RATE(CFS)   =       0.94
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
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              Ver. 18.0 Release Date: 07/01/2011  License ID 1499

                           Analysis prepared by:




 ************************** DESCRIPTION OF STUDY **************************
* ONPOINT OCEANSIDE                                                      *
* 100 YEAR EXISTING RATIONAL METHOD HYDROLOGY                            *
* 3/28/2018 KA                                                           *
 ************************************************************************

  FILE NAME: OPE100.DAT
  TIME/DATE OF STUDY: 08:23 03/29/2018
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  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.600
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.    (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

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

************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
========================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .6700
  S.C.S. CURVE NUMBER (AMC II) =  86
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =     33.34
  DOWNSTREAM ELEVATION(FEET) =     32.13
  ELEVATION DIFFERENCE(FEET) =      1.21
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.950
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    67.10
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.123
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.41

************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
```

```
--------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     32.13  DOWNSTREAM(FEET) =     28.57
  CHANNEL LENGTH THRU SUBAREA(FEET) =   453.00   CHANNEL SLOPE =  0.0079
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.596
  USER-SPECIFIED RUNOFF COEFFICIENT = .6700
  S.C.S. CURVE NUMBER (AMC II) =  86
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.59
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.99
  AVERAGE FLOW DEPTH(FEET) =   0.22   TRAVEL TIME(MIN.) =   7.63
  Tc(MIN.) =   13.58
  SUBAREA AREA(ACRES) =     3.33       SUBAREA RUNOFF(CFS) =    8.02
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.670
  TOTAL AREA(ACRES) =        3.4         PEAK FLOW RATE(CFS) =       8.26

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.27   FLOW VELOCITY(FEET/SEC.) =   1.15
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     553.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .6700
  S.C.S. CURVE NUMBER (AMC II) =  86
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =     31.23
  DOWNSTREAM ELEVATION(FEET) =     28.15
  ELEVATION DIFFERENCE(FEET) =      3.08
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.053
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    90.20
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.804
  SUBAREA RUNOFF(CFS) =      1.37
  TOTAL AREA(ACRES) =      0.30   TOTAL RUNOFF(CFS) =      1.37
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.3  TC(MIN.) =      5.05
  PEAK FLOW RATE(CFS)   =       1.37
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2011 Advanced Engineering Software (aes)
              Ver. 18.0 Release Date: 07/01/2011  License ID 1499

                           Analysis prepared by:



 ************************* DESCRIPTION OF STUDY *************************
* ONPOINT OCEANSIDE                                                      *
* 2 YEAR PROPOSED RATIONAL METHOD HYDROLOGY                              *
* 12/13/2018 KA                                                          *
 ************************************************************************

  FILE NAME: OPPR2.DAT
  TIME/DATE OF STUDY: 07:31 12/13/2018
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =   2.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   1.280
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =     40.80
  DOWNSTREAM ELEVATION(FEET) =     40.30
  ELEVATION DIFFERENCE(FEET) =      0.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.818
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.372
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.27
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.27

**************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
--------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
```

```
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     40.30  DOWNSTREAM(FEET) =     34.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =    82.00   CHANNEL SLOPE =  0.0707
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.372
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.45
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.90
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   0.72
  Tc(MIN.) =    4.54
  SUBAREA AREA(ACRES) =     0.13       SUBAREA RUNOFF(CFS) =    0.35
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.62

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.05   FLOW VELOCITY(FEET/SEC.) =   2.45
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     132.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    30.00  DOWNSTREAM(FEET) =    25.00
  FLOW LENGTH(FEET) =    17.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   1.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.03
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.62
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    4.56
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =     149.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    74.00
  UPSTREAM ELEVATION(FEET) =     36.26
  DOWNSTREAM ELEVATION(FEET) =     34.77
  ELEVATION DIFFERENCE(FEET) =      1.49
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.679
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.372
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.27
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.27

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     34.77  DOWNSTREAM(FEET) =     33.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    50.00   CHANNEL SLOPE =  0.0354
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.372
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.34
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.44
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   0.58
```

```
  Tc(MIN.) =    4.26
  SUBAREA AREA(ACRES) =     0.05       SUBAREA RUNOFF(CFS) =    0.13
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.40

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.05   FLOW VELOCITY(FEET/SEC.) =   1.60
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     124.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    303.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.92  DOWNSTREAM(FEET) =    25.00
  FLOW LENGTH(FEET) =    93.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.46
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.40
  PIPE TRAVEL TIME(MIN.) =   0.35    Tc(MIN.) =    4.61
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    303.00 =     217.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    303.00 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.) =    4.61
  RAINFALL INTENSITY(INCH/HR) =   3.37
  TOTAL STREAM AREA(ACRES) =     0.15
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.40

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =     36.46
  DOWNSTREAM ELEVATION(FEET) =     35.77
  ELEVATION DIFFERENCE(FEET) =      0.69
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.482
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    53.80
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.372
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.27
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.27

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    303.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     35.77  DOWNSTREAM(FEET) =     34.71
  CHANNEL LENGTH THRU SUBAREA(FEET) =   115.00   CHANNEL SLOPE =  0.0092
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.007
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
```

```
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.53
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.29
  AVERAGE FLOW DEPTH(FEET) =   0.11   TRAVEL TIME(MIN.) =   1.49
  Tc(MIN.) =    5.97
  SUBAREA AREA(ACRES) =     1.04       SUBAREA RUNOFF(CFS) =    2.50
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  TOTAL AREA(ACRES) =        1.1         PEAK FLOW RATE(CFS) =       2.74

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.13   FLOW VELOCITY(FEET/SEC.) =   1.58
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    303.00 =     215.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    303.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.97
  RAINFALL INTENSITY(INCH/HR) =   3.01
  TOTAL STREAM AREA(ACRES) =     1.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.74

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        0.40     4.61        3.372          0.15
      2        2.74     5.97        3.007          1.14

  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        2.52     4.61       3.372
      2        3.10     5.97       3.007

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.10   Tc(MIN.) =    5.97
  TOTAL AREA(ACRES) =        1.3
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    303.00 =     217.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =     33.53
  DOWNSTREAM ELEVATION(FEET) =     32.46
  ELEVATION DIFFERENCE(FEET) =      1.07
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.125
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    61.05
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.372
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.27
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.27

****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
```

```
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     32.46  DOWNSTREAM(FEET) =     30.71
  CHANNEL LENGTH THRU SUBAREA(FEET) =   186.00   CHANNEL SLOPE =  0.0094
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.603
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.29
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.93
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   3.35
  Tc(MIN.) =    7.47
  SUBAREA AREA(ACRES) =     0.02       SUBAREA RUNOFF(CFS) =    0.04
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.27

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   0.86
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    402.00 =     286.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    502.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.00  DOWNSTREAM(FEET) =    26.50
  FLOW LENGTH(FEET) =    61.50   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.46
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.27
  PIPE TRAVEL TIME(MIN.) =   0.42    Tc(MIN.) =    7.89
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    502.00 =     347.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    502.00 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.) =    7.89
  RAINFALL INTENSITY(INCH/HR) =   2.51
  TOTAL STREAM AREA(ACRES) =     0.12
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.27

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    501.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =     36.30
  DOWNSTREAM ELEVATION(FEET) =     32.43
  ELEVATION DIFFERENCE(FEET) =      3.87
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.090
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.372
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.27
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.27

****************************************************************************
  FLOW PROCESS FROM NODE    501.00 TO NODE    502.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =     32.43  DOWNSTREAM(FEET) =     30.13
  CHANNEL LENGTH THRU SUBAREA(FEET) =    24.00   CHANNEL SLOPE =  0.0958
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.372
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.34
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.03
  AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =   0.20
  Tc(MIN.) =    2.29
  SUBAREA AREA(ACRES) =     0.05       SUBAREA RUNOFF(CFS) =    0.13
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.40

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.04   FLOW VELOCITY(FEET/SEC.) =   2.43
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    502.00 =      79.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    502.00 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.) =    2.29
  RAINFALL INTENSITY(INCH/HR) =   3.37
  TOTAL STREAM AREA(ACRES) =     0.15
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.40

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        0.27     7.89        2.513          0.12
      2        0.40     2.29        3.372          0.15

  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        0.48     2.29       3.372
      2        0.57     7.89       2.513

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       0.57   Tc(MIN.) =    7.89
  TOTAL AREA(ACRES) =        0.3
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    502.00 =     347.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    804.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    26.50  DOWNSTREAM(FEET) =    25.00
  FLOW LENGTH(FEET) =    80.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.10
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.57
  PIPE TRAVEL TIME(MIN.) =   0.33    Tc(MIN.) =    8.21
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    804.00 =     427.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    804.00 TO NODE    804.00 IS CODE =  10
```

```
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    601.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    52.00
  UPSTREAM ELEVATION(FEET) =     40.80
  DOWNSTREAM ELEVATION(FEET) =     40.28
  ELEVATION DIFFERENCE(FEET) =      0.52
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.894
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.372
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.27
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.27

****************************************************************************
  FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     40.28  DOWNSTREAM(FEET) =     33.31
  CHANNEL LENGTH THRU SUBAREA(FEET) =   182.00   CHANNEL SLOPE =  0.0383
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.252
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.93
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.17
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   1.40
  Tc(MIN.) =    5.29
  SUBAREA AREA(ACRES) =     0.52       SUBAREA RUNOFF(CFS) =    1.35
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       1.61

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   2.48
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    602.00 =     234.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    602.00 TO NODE    603.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    28.31  DOWNSTREAM(FEET) =    27.93
  FLOW LENGTH(FEET) =    19.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   4.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.61
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.61
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    5.35
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    603.00 =     253.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    700.00 TO NODE    701.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =     36.15
```

```
  DOWNSTREAM ELEVATION(FEET) =     35.32
  ELEVATION DIFFERENCE(FEET) =      0.83
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.323
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    56.60
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.372
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.27
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.27

****************************************************************************
  FLOW PROCESS FROM NODE    701.00 TO NODE    702.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     35.32  DOWNSTREAM(FEET) =     32.98
  CHANNEL LENGTH THRU SUBAREA(FEET) =   124.00   CHANNEL SLOPE =  0.0189
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.070
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.47
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.41
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   1.46
  Tc(MIN.) =    5.78
  SUBAREA AREA(ACRES) =     0.17       SUBAREA RUNOFF(CFS) =    0.42
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       0.66

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   1.55
  LONGEST FLOWPATH FROM NODE    700.00 TO NODE    702.00 =     224.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    702.00 TO NODE    804.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    26.00  DOWNSTREAM(FEET) =    25.00
  FLOW LENGTH(FEET) =    90.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   3.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.55
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.66
  PIPE TRAVEL TIME(MIN.) =   0.42    Tc(MIN.) =    6.21
  LONGEST FLOWPATH FROM NODE    700.00 TO NODE    804.00 =     314.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    804.00 TO NODE    804.00 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        0.66     6.21       2.933        0.27
  LONGEST FLOWPATH FROM NODE    700.00 TO NODE    804.00 =     314.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        0.57     8.21       2.449        0.27
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    804.00 =     427.50 FEET.
```

```
  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1       1.09       6.21        2.933
      2       1.12       8.21        2.449

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.12   Tc(MIN.) =    8.21
  TOTAL AREA(ACRES) =        0.5

****************************************************************************
  FLOW PROCESS FROM NODE    804.00 TO NODE    804.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    804.00 TO NODE    804.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.21
  RAINFALL INTENSITY(INCH/HR) =   2.45
  TOTAL STREAM AREA(ACRES) =     0.54
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.12

****************************************************************************
  FLOW PROCESS FROM NODE    800.00 TO NODE    801.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    45.00
  UPSTREAM ELEVATION(FEET) =     35.76
  DOWNSTREAM ELEVATION(FEET) =     33.54
  ELEVATION DIFFERENCE(FEET) =      2.22
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.128
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.372
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.27
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.27

****************************************************************************
  FLOW PROCESS FROM NODE    801.00 TO NODE    803.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     33.54  DOWNSTREAM(FEET) =     32.83
  CHANNEL LENGTH THRU SUBAREA(FEET) =   188.00   CHANNEL SLOPE =  0.0038
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.980
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.62
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.80
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =   3.93
  Tc(MIN.) =    6.06
  SUBAREA AREA(ACRES) =     0.30       SUBAREA RUNOFF(CFS) =    0.72
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  TOTAL AREA(ACRES) =        0.4         PEAK FLOW RATE(CFS) =       0.95

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.10   FLOW VELOCITY(FEET/SEC.) =   0.89
  LONGEST FLOWPATH FROM NODE    800.00 TO NODE    803.00 =     233.00 FEET.

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

```
  FLOW PROCESS FROM NODE    803.00 TO NODE    804.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    25.50  DOWNSTREAM(FEET) =    25.00
  FLOW LENGTH(FEET) =    18.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   3.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.44
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.95
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    6.11
  LONGEST FLOWPATH FROM NODE    800.00 TO NODE    804.00 =     251.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    804.00 TO NODE    804.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.11
  RAINFALL INTENSITY(INCH/HR) =   2.96
  TOTAL STREAM AREA(ACRES) =     0.40
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.95

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        1.12     8.21        2.449          0.54
      2        0.95     6.11        2.963          0.40

  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        1.79     6.11       2.963
      2        1.91     8.21       2.449

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.91   Tc(MIN.) =    8.21
  TOTAL AREA(ACRES) =        0.9
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    804.00 =     427.50 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.9  TC(MIN.) =      8.21
  PEAK FLOW RATE(CFS)   =       1.91
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2011 Advanced Engineering Software (aes)
              Ver. 18.0 Release Date: 07/01/2011  License ID 1499

                           Analysis prepared by:




 ************************* DESCRIPTION OF STUDY *************************
* ONPOINT OCEANSIDE                                                      *
* 10 YEAR PROPOSED RATIONAL METHOD HYDROLOGY                             *
* 12/13/2018 KA                                                          *
 ************************************************************************

  FILE NAME: OPPR10.DAT
  TIME/DATE OF STUDY: 07:33 12/13/2018
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =   2.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   1.790
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
========================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =     40.80
  DOWNSTREAM ELEVATION(FEET) =     40.30
  ELEVATION DIFFERENCE(FEET) =      0.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.818
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.716
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.38
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.38

**************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
```

```
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     40.30  DOWNSTREAM(FEET) =     34.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =    82.00   CHANNEL SLOPE =  0.0707
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.716
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.62
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.46
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   0.56
  Tc(MIN.) =    4.37
  SUBAREA AREA(ACRES) =     0.13       SUBAREA RUNOFF(CFS) =    0.49
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.87

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   2.59
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     132.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    30.00  DOWNSTREAM(FEET) =    25.00
  FLOW LENGTH(FEET) =    17.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   1.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.18
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.87
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    4.40
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =     149.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    74.00
  UPSTREAM ELEVATION(FEET) =     36.26
  DOWNSTREAM ELEVATION(FEET) =     34.77
  ELEVATION DIFFERENCE(FEET) =      1.49
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.679
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.716
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.38
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.38

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     34.77  DOWNSTREAM(FEET) =     33.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    50.00   CHANNEL SLOPE =  0.0354
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.716
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.47
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.50
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.55
```

```
  Tc(MIN.) =    4.23
  SUBAREA AREA(ACRES) =     0.05       SUBAREA RUNOFF(CFS) =    0.19
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.57

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   1.69
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     124.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    303.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.92  DOWNSTREAM(FEET) =    25.00
  FLOW LENGTH(FEET) =    93.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.92
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.57
  PIPE TRAVEL TIME(MIN.) =   0.32    Tc(MIN.) =    4.55
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    303.00 =     217.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    303.00 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.) =    4.55
  RAINFALL INTENSITY(INCH/HR) =   4.72
  TOTAL STREAM AREA(ACRES) =     0.15
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.57

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =     36.46
  DOWNSTREAM ELEVATION(FEET) =     35.77
  ELEVATION DIFFERENCE(FEET) =      0.69
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.482
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    53.80
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.716
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.38
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.38

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    303.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     35.77  DOWNSTREAM(FEET) =     34.71
  CHANNEL LENGTH THRU SUBAREA(FEET) =   115.00   CHANNEL SLOPE =  0.0092
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.322
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
```

```
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.17
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.54
  AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =   1.24
  Tc(MIN.) =    5.72
  SUBAREA AREA(ACRES) =     1.04       SUBAREA RUNOFF(CFS) =    3.60
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  TOTAL AREA(ACRES) =        1.1         PEAK FLOW RATE(CFS) =       3.94

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.15   FLOW VELOCITY(FEET/SEC.) =   1.78
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    303.00 =     215.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    303.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.72
  RAINFALL INTENSITY(INCH/HR) =   4.32
  TOTAL STREAM AREA(ACRES) =     1.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.94

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        0.57     4.55        4.716          0.15
      2        3.94     5.72        4.322          1.14

  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        3.70     4.55       4.716
      2        4.46     5.72       4.322

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       4.46   Tc(MIN.) =    5.72
  TOTAL AREA(ACRES) =        1.3
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    303.00 =     217.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =     33.53
  DOWNSTREAM ELEVATION(FEET) =     32.46
  ELEVATION DIFFERENCE(FEET) =      1.07
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.125
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    61.05
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.716
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.38
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.38

****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
```

```
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     32.46  DOWNSTREAM(FEET) =     30.71
  CHANNEL LENGTH THRU SUBAREA(FEET) =   186.00   CHANNEL SLOPE =  0.0094
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.665
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.41
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.95
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   3.27
  Tc(MIN.) =    7.39
  SUBAREA AREA(ACRES) =     0.02       SUBAREA RUNOFF(CFS) =    0.06
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.38

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   0.93
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    402.00 =     286.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    502.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.00  DOWNSTREAM(FEET) =    26.50
  FLOW LENGTH(FEET) =    61.50   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.71
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.38
  PIPE TRAVEL TIME(MIN.) =   0.38    Tc(MIN.) =    7.77
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    502.00 =     347.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    502.00 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.) =    7.77
  RAINFALL INTENSITY(INCH/HR) =   3.55
  TOTAL STREAM AREA(ACRES) =     0.12
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.38

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    501.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =     36.30
  DOWNSTREAM ELEVATION(FEET) =     32.43
  ELEVATION DIFFERENCE(FEET) =      3.87
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.090
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.716
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.38
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.38

****************************************************************************
  FLOW PROCESS FROM NODE    501.00 TO NODE    502.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =     32.43  DOWNSTREAM(FEET) =     30.13
  CHANNEL LENGTH THRU SUBAREA(FEET) =    24.00   CHANNEL SLOPE =  0.0958
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.716
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.47
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.59
  AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =   0.15
  Tc(MIN.) =    2.24
  SUBAREA AREA(ACRES) =     0.05       SUBAREA RUNOFF(CFS) =    0.19
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.57

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.05   FLOW VELOCITY(FEET/SEC.) =   2.42
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    502.00 =      79.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    502.00 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.) =    2.24
  RAINFALL INTENSITY(INCH/HR) =   4.72
  TOTAL STREAM AREA(ACRES) =     0.15
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.57

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        0.38     7.77        3.549          0.12
      2        0.57     2.24        4.716          0.15

  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        0.67     2.24       4.716
      2        0.80     7.77       3.549

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       0.80   Tc(MIN.) =    7.77
  TOTAL AREA(ACRES) =        0.3
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    502.00 =     347.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    804.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    26.50  DOWNSTREAM(FEET) =    25.00
  FLOW LENGTH(FEET) =    80.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   3.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.51
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.80
  PIPE TRAVEL TIME(MIN.) =   0.30    Tc(MIN.) =    8.07
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    804.00 =     427.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    804.00 TO NODE    804.00 IS CODE =  10
```

```
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    601.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    52.00
  UPSTREAM ELEVATION(FEET) =     40.80
  DOWNSTREAM ELEVATION(FEET) =     40.28
  ELEVATION DIFFERENCE(FEET) =      0.52
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.894
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.716
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.38
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.38

****************************************************************************
  FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     40.28  DOWNSTREAM(FEET) =     33.31
  CHANNEL LENGTH THRU SUBAREA(FEET) =   182.00   CHANNEL SLOPE =  0.0383
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.534
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.32
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.14
  AVERAGE FLOW DEPTH(FEET) =   0.08   TRAVEL TIME(MIN.) =   1.42
  Tc(MIN.) =    5.31
  SUBAREA AREA(ACRES) =     0.52       SUBAREA RUNOFF(CFS) =    1.89
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       2.25

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   2.55
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    602.00 =     234.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    602.00 TO NODE    603.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    28.31  DOWNSTREAM(FEET) =    27.93
  FLOW LENGTH(FEET) =    19.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.11
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.25
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    5.37
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    603.00 =     253.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    700.00 TO NODE    701.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =     36.15
```

```
  DOWNSTREAM ELEVATION(FEET) =     35.32
  ELEVATION DIFFERENCE(FEET) =      0.83
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.323
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    56.60
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.716
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.38
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.38

****************************************************************************
  FLOW PROCESS FROM NODE    701.00 TO NODE    702.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     35.32  DOWNSTREAM(FEET) =     32.98
  CHANNEL LENGTH THRU SUBAREA(FEET) =   124.00   CHANNEL SLOPE =  0.0189
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.359
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.67
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.56
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   1.33
  Tc(MIN.) =    5.65
  SUBAREA AREA(ACRES) =     0.17       SUBAREA RUNOFF(CFS) =    0.59
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       0.94

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   1.52
  LONGEST FLOWPATH FROM NODE    700.00 TO NODE    702.00 =     224.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    702.00 TO NODE    804.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    26.00  DOWNSTREAM(FEET) =    25.00
  FLOW LENGTH(FEET) =    90.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   4.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.92
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.94
  PIPE TRAVEL TIME(MIN.) =   0.38    Tc(MIN.) =    6.03
  LONGEST FLOWPATH FROM NODE    700.00 TO NODE    804.00 =     314.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    804.00 TO NODE    804.00 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        0.94     6.03       4.179        0.27
  LONGEST FLOWPATH FROM NODE    700.00 TO NODE    804.00 =     314.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        0.80     8.07       3.464        0.27
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    804.00 =     427.50 FEET.
```

```
  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1       1.54       6.03        4.179
      2       1.58       8.07        3.464

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.58   Tc(MIN.) =    8.07
  TOTAL AREA(ACRES) =        0.5

****************************************************************************
  FLOW PROCESS FROM NODE    804.00 TO NODE    804.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    804.00 TO NODE    804.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.07
  RAINFALL INTENSITY(INCH/HR) =   3.46
  TOTAL STREAM AREA(ACRES) =     0.54
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.58

****************************************************************************
  FLOW PROCESS FROM NODE    800.00 TO NODE    801.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    45.00
  UPSTREAM ELEVATION(FEET) =     35.76
  DOWNSTREAM ELEVATION(FEET) =     33.54
  ELEVATION DIFFERENCE(FEET) =      2.22
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.128
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.716
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.38
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.38

****************************************************************************
  FLOW PROCESS FROM NODE    801.00 TO NODE    803.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     33.54  DOWNSTREAM(FEET) =     32.83
  CHANNEL LENGTH THRU SUBAREA(FEET) =   188.00   CHANNEL SLOPE =  0.0038
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.258
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.90
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.84
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   3.73
  Tc(MIN.) =    5.86
  SUBAREA AREA(ACRES) =     0.30       SUBAREA RUNOFF(CFS) =    1.02
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  TOTAL AREA(ACRES) =        0.4         PEAK FLOW RATE(CFS) =       1.36

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   0.97
  LONGEST FLOWPATH FROM NODE    800.00 TO NODE    803.00 =     233.00 FEET.

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

```
  FLOW PROCESS FROM NODE    803.00 TO NODE    804.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    25.50  DOWNSTREAM(FEET) =    25.00
  FLOW LENGTH(FEET) =    18.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   4.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.01
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.36
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    5.91
  LONGEST FLOWPATH FROM NODE    800.00 TO NODE    804.00 =     251.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    804.00 TO NODE    804.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.91
  RAINFALL INTENSITY(INCH/HR) =   4.23
  TOTAL STREAM AREA(ACRES) =     0.40
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.36

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        1.58     8.07        3.464          0.54
      2        1.36     5.91        4.235          0.40

  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        2.52     5.91       4.235
      2        2.70     8.07       3.464

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       2.70   Tc(MIN.) =    8.07
  TOTAL AREA(ACRES) =        0.9
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    804.00 =     427.50 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.9  TC(MIN.) =      8.07
  PEAK FLOW RATE(CFS)   =       2.70
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2011 Advanced Engineering Software (aes)
              Ver. 18.0 Release Date: 07/01/2011  License ID 1499

                           Analysis prepared by:




 ************************* DESCRIPTION OF STUDY *************************
* ONPOINT OCEANSIDE                                                      *
* 100 YEAR PROPOSED RATIONAL METHOD HYDROLOGY                            *
* 12/13/2018 KA                                                          *
 ************************************************************************

  FILE NAME: OPPR100.DAT
  TIME/DATE OF STUDY: 07:34 12/13/2018
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =   2.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.600
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
========================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =     40.80
  DOWNSTREAM ELEVATION(FEET) =     40.30
  ELEVATION DIFFERENCE(FEET) =      0.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.818
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.55
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.55

**************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
```

```
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     40.30  DOWNSTREAM(FEET) =     34.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =    82.00   CHANNEL SLOPE =  0.0707
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.90
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.70
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.51
  Tc(MIN.) =    4.32
  SUBAREA AREA(ACRES) =     0.13       SUBAREA RUNOFF(CFS) =    0.71
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       1.26

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   2.94
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     132.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    30.00  DOWNSTREAM(FEET) =    25.00
  FLOW LENGTH(FEET) =    17.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.59
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.26
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    4.35
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =     149.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    74.00
  UPSTREAM ELEVATION(FEET) =     36.26
  DOWNSTREAM ELEVATION(FEET) =     34.77
  ELEVATION DIFFERENCE(FEET) =      1.49
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.679
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.55
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.55

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     34.77  DOWNSTREAM(FEET) =     33.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    50.00   CHANNEL SLOPE =  0.0354
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.69
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.69
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.49
```

```
  Tc(MIN.) =    4.17
  SUBAREA AREA(ACRES) =     0.05       SUBAREA RUNOFF(CFS) =    0.27
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.82

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   1.92
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     124.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    303.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.92  DOWNSTREAM(FEET) =    25.00
  FLOW LENGTH(FEET) =    93.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   3.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.46
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.82
  PIPE TRAVEL TIME(MIN.) =   0.28    Tc(MIN.) =    4.45
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    303.00 =     217.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    303.00 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.) =    4.45
  RAINFALL INTENSITY(INCH/HR) =   6.85
  TOTAL STREAM AREA(ACRES) =     0.15
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.82

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =     36.46
  DOWNSTREAM ELEVATION(FEET) =     35.77
  ELEVATION DIFFERENCE(FEET) =      0.69
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.482
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    53.80
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.55
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.55

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    303.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     35.77  DOWNSTREAM(FEET) =     34.71
  CHANNEL LENGTH THRU SUBAREA(FEET) =   115.00   CHANNEL SLOPE =  0.0092
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.331
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
```

```
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.19
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.64
  AVERAGE FLOW DEPTH(FEET) =   0.14   TRAVEL TIME(MIN.) =   1.17
  Tc(MIN.) =    5.65
  SUBAREA AREA(ACRES) =     1.04       SUBAREA RUNOFF(CFS) =    5.27
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  TOTAL AREA(ACRES) =        1.1         PEAK FLOW RATE(CFS) =       5.77

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.18   FLOW VELOCITY(FEET/SEC.) =   1.83
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    303.00 =     215.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    303.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.65
  RAINFALL INTENSITY(INCH/HR) =   6.33
  TOTAL STREAM AREA(ACRES) =     1.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.77

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        0.82     4.45        6.850          0.15
      2        5.77     5.65        6.331          1.14

  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        5.37     4.45       6.850
      2        6.53     5.65       6.331

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       6.53   Tc(MIN.) =    5.65
  TOTAL AREA(ACRES) =        1.3
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    303.00 =     217.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =     33.53
  DOWNSTREAM ELEVATION(FEET) =     32.46
  ELEVATION DIFFERENCE(FEET) =      1.07
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.125
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    61.05
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.55
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.55

****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
```

```
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     32.46  DOWNSTREAM(FEET) =     30.71
  CHANNEL LENGTH THRU SUBAREA(FEET) =   186.00   CHANNEL SLOPE =  0.0094
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.556
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.59
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.11
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   2.79
  Tc(MIN.) =    6.92
  SUBAREA AREA(ACRES) =     0.02       SUBAREA RUNOFF(CFS) =    0.09
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.55

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   1.03
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    402.00 =     286.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    502.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.00  DOWNSTREAM(FEET) =    26.50
  FLOW LENGTH(FEET) =    61.50   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   3.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.99
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.55
  PIPE TRAVEL TIME(MIN.) =   0.34    Tc(MIN.) =    7.26
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    502.00 =     347.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    502.00 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.) =    7.26
  RAINFALL INTENSITY(INCH/HR) =   5.39
  TOTAL STREAM AREA(ACRES) =     0.12
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.55

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    501.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =     36.30
  DOWNSTREAM ELEVATION(FEET) =     32.43
  ELEVATION DIFFERENCE(FEET) =      3.87
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.090
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.55
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.55

****************************************************************************
  FLOW PROCESS FROM NODE    501.00 TO NODE    502.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =     32.43  DOWNSTREAM(FEET) =     30.13
  CHANNEL LENGTH THRU SUBAREA(FEET) =    24.00   CHANNEL SLOPE =  0.0958
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.69
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.71
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   0.15
  Tc(MIN.) =    2.24
  SUBAREA AREA(ACRES) =     0.05       SUBAREA RUNOFF(CFS) =    0.27
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.82

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   2.62
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    502.00 =      79.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    502.00 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.) =    2.24
  RAINFALL INTENSITY(INCH/HR) =   6.85
  TOTAL STREAM AREA(ACRES) =     0.15
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.82

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        0.55     7.26        5.386          0.12
      2        0.82     2.24        6.850          0.15

  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        0.99     2.24       6.850
      2        1.19     7.26       5.386

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.19   Tc(MIN.) =    7.26
  TOTAL AREA(ACRES) =        0.3
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    502.00 =     347.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    804.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    26.50  DOWNSTREAM(FEET) =    25.00
  FLOW LENGTH(FEET) =    80.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   4.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.05
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.19
  PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =    7.52
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    804.00 =     427.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    804.00 TO NODE    804.00 IS CODE =  10
```

```
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    601.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    52.00
  UPSTREAM ELEVATION(FEET) =     40.80
  DOWNSTREAM ELEVATION(FEET) =     40.28
  ELEVATION DIFFERENCE(FEET) =      0.52
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.894
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.55
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.55

****************************************************************************
  FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     40.28  DOWNSTREAM(FEET) =     33.31
  CHANNEL LENGTH THRU SUBAREA(FEET) =   182.00   CHANNEL SLOPE =  0.0383
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.762
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.96
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.51
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =   1.21
  Tc(MIN.) =    5.10
  SUBAREA AREA(ACRES) =     0.52       SUBAREA RUNOFF(CFS) =    2.81
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       3.35

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.11   FLOW VELOCITY(FEET/SEC.) =   2.82
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    602.00 =     234.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    602.00 TO NODE    603.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    28.31  DOWNSTREAM(FEET) =    27.93
  FLOW LENGTH(FEET) =    19.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.74
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.35
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    5.15
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    603.00 =     253.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    700.00 TO NODE    701.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =     36.15
  DOWNSTREAM ELEVATION(FEET) =     35.32
```

```
  ELEVATION DIFFERENCE(FEET) =      0.83
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.323
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    56.60
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.55
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.55

****************************************************************************
  FLOW PROCESS FROM NODE    701.00 TO NODE    702.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     35.32  DOWNSTREAM(FEET) =     32.98
  CHANNEL LENGTH THRU SUBAREA(FEET) =   124.00   CHANNEL SLOPE =  0.0189
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.343
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.98
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.58
  AVERAGE FLOW DEPTH(FEET) =   0.08   TRAVEL TIME(MIN.) =   1.31
  Tc(MIN.) =    5.63
  SUBAREA AREA(ACRES) =     0.17       SUBAREA RUNOFF(CFS) =    0.86
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       1.37

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   1.76
  LONGEST FLOWPATH FROM NODE    700.00 TO NODE    702.00 =     224.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    702.00 TO NODE    804.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    26.00  DOWNSTREAM(FEET) =    25.00
  FLOW LENGTH(FEET) =    90.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.33
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.37
  PIPE TRAVEL TIME(MIN.) =   0.35    Tc(MIN.) =    5.98
  LONGEST FLOWPATH FROM NODE    700.00 TO NODE    804.00 =     314.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    804.00 TO NODE    804.00 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        1.37     5.98       6.104        0.27
  LONGEST FLOWPATH FROM NODE    700.00 TO NODE    804.00 =     314.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        1.19     7.52       5.263        0.27
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    804.00 =     427.50 FEET.

  ** PEAK FLOW RATE TABLE **
```

```
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1       2.32       5.98        6.104
      2       2.38       7.52        5.263

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       2.38   Tc(MIN.) =    7.52
  TOTAL AREA(ACRES) =        0.5

****************************************************************************
  FLOW PROCESS FROM NODE    804.00 TO NODE    804.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    804.00 TO NODE    804.00 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.) =    7.52
  RAINFALL INTENSITY(INCH/HR) =   5.26
  TOTAL STREAM AREA(ACRES) =     0.54
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.38

****************************************************************************
  FLOW PROCESS FROM NODE    800.00 TO NODE    801.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    45.00
  UPSTREAM ELEVATION(FEET) =     35.76
  DOWNSTREAM ELEVATION(FEET) =     33.54
  ELEVATION DIFFERENCE(FEET) =      2.22
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.128
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.850
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.55
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.55

****************************************************************************
  FLOW PROCESS FROM NODE    801.00 TO NODE    803.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     33.54  DOWNSTREAM(FEET) =     32.83
  CHANNEL LENGTH THRU SUBAREA(FEET) =   188.00   CHANNEL SLOPE =  0.0038
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.496
  USER-SPECIFIED RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =  92
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.34
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.95
  AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =   3.30
  Tc(MIN.) =    5.43
  SUBAREA AREA(ACRES) =     0.30       SUBAREA RUNOFF(CFS) =    1.56
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  TOTAL AREA(ACRES) =        0.4         PEAK FLOW RATE(CFS) =       2.08

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.14   FLOW VELOCITY(FEET/SEC.) =   1.04
  LONGEST FLOWPATH FROM NODE    800.00 TO NODE    803.00 =     233.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    803.00 TO NODE    804.00 IS CODE =  31
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    25.50  DOWNSTREAM(FEET) =    25.00
  FLOW LENGTH(FEET) =    18.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.77
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.08
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    5.47
  LONGEST FLOWPATH FROM NODE    800.00 TO NODE    804.00 =     251.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    804.00 TO NODE    804.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.47
  RAINFALL INTENSITY(INCH/HR) =   6.46
  TOTAL STREAM AREA(ACRES) =     0.40
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.08

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        2.38     7.52        5.263          0.54
      2        2.08     5.47        6.462          0.40

  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        3.81     5.47       6.462
      2        4.07     7.52       5.263

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       4.07   Tc(MIN.) =    7.52
  TOTAL AREA(ACRES) =        0.9
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    804.00 =     427.50 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.9  TC(MIN.) =      7.52
  PEAK FLOW RATE(CFS)   =       4.07
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```