SCHEU INDUSTRIAL PARK

Rancho Cucamonga, CA

PRELIMINARY DRAINAGE STUDY

March 22, 2018

Reference 149-215.022

PREPARED BY:

Encompass Associates, Inc.

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_____

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CONTENTS

DISCUSSION

The purpose of this preliminary drainage study is to determine the drainage facility requirements for Scheu Industrial Park in Rancho Cucamonga. Specifically, the subject project is located south of Acacia Street, west of industrial businesses, north of 7th Street, and east of Archibald Avenue, in the City of Rancho Cucamonga, County of San Bernardino, California.

The subject site will consist of 4 warehouse buildings, with an approximate area of 16 acres. Proposed drainage is overland and by sheet flow generally in a southwesterly direction. The site is not subject to off-site runoff.

The project is tributary to an existing storm drain in Archibald Avenue. A storm drain in 7th Street will be constructed to collect runoff from multiple on-site subareas.

The 100-year storm event was modeled in the rational method hydrology calculations in this study.

The rational method hydrologic model, as defined by Flood Control for San Bernardino County, was followed in the determination of storm runoff. AES software was utilized for hydrology calculations and some street flow depth analysis.

RATIONAL METHOD

HYDROLOGY

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_____
  *******************************************************************************
                 RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
               (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
               (c) Copyright 1983-2012 Advanced Engineering Software (aes)
                  Ver. 19.0  Release Date: 06/01/2012  License ID 1584

                              Analysis prepared by:

                           ENCOMPASS ASSOCIATES, INC.
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                       909-684-0093 askeers@encompasscivil.com

   ************************* DESCRIPTION OF STUDY *************************
  * SCHEU PROPERTY - NEC 7TH AND ARCHIBALD                                       *
  * DEVELOPED HYDROLOGY                                                          *
  * 100-YEAR                                                                     *
   *****************************************************************************

     FILE NAME: Z:\FTP\AES\SCHUED00.DAT
     TIME/DATE OF STUDY: 09:34 03/22/2018
  ===============================================================================
     USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
  ===============================================================================
                        --*TIME-OF-CONCENTRATION MODEL*--

     USER SPECIFIED STORM EVENT(YEAR) =  100.00
     SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
     SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
     *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

     SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
     USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.4000

     *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

     *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
         HALF-   CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
         WIDTH  CROSSFALL  IN- / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE   FACTOR
     NO.  (FT)     (FT)     SIDE / SIDE/ WAY   (FT)    (FT)  (FT)  (FT)     (n)
     === =====  ========= ================= ======  ===== ====== ===== =======
      1  30.0     20.0     0.018/0.018/0.020   0.67    2.00 0.0313 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.*
     *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

  *******************************************************************************
     FLOW PROCESS FROM NODE     1.00 TO NODE      2.00 IS CODE =  21
  -------------------------------------------------------------------------------
     >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
     >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
```

```
===============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    660.00
  ELEVATION DATA: UPSTREAM(FEET) =     97.00  DOWNSTREAM(FEET) =      87.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.432
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.249
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL    AREA       Fp         Ap      SCS    Tc
       LAND USE            GROUP     (ACRES)  (INCH/HR)  (DECIMAL)  CN   (MIN.)
  COMMERCIAL                 B         0.90      0.75      0.100     56    9.43
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =        3.38
  TOTAL AREA(ACRES) =        0.90   PEAK FLOW RATE(CFS) =        3.38

*******************************************************************************
  FLOW PROCESS FROM NODE     2.00 TO NODE      3.00 IS CODE =   31
-------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
===============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     82.00  DOWNSTREAM(FEET) =    78.00
  FLOW LENGTH(FEET) =    715.00    MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =    4.18
  ESTIMATED PIPE DIAMETER(INCH) =  15.00     NUMBER OF PIPES =    1
  PIPE-FLOW(CFS) =        3.38
  PIPE TRAVEL TIME(MIN.) =   2.85    Tc(MIN.) =   12.28
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =    1375.00 FEET.

*******************************************************************************
  FLOW PROCESS FROM NODE     3.00 TO NODE      3.00 IS CODE =   10
-------------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
===============================================================================

*******************************************************************************
  FLOW PROCESS FROM NODE     3.00 TO NODE      3.00 IS CODE =   13
-------------------------------------------------------------------------------
  >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
===============================================================================

*******************************************************************************
  FLOW PROCESS FROM NODE     1.00 TO NODE      3.10 IS CODE =   21
-------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
===============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    904.00
  ELEVATION DATA: UPSTREAM(FEET) =     97.00  DOWNSTREAM(FEET) =      86.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.176
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.837
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL    AREA       Fp         Ap      SCS    Tc
```

```
         LAND USE            GROUP  (ACRES)  (INCH/HR)  (DECIMAL)  CN   (MIN.)
  COMMERCIAL                   B      1.20      0.75       0.100    56   11.18
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      4.06
  TOTAL AREA(ACRES) =        1.20   PEAK FLOW RATE(CFS) =      4.06


*****************************************************************************
  FLOW PROCESS FROM NODE      3.10 TO NODE      3.10 IS CODE =  81
-----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=============================================================================
  MAINLINE Tc(MIN.) =   11.18
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.837
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA       Fp        Ap      SCS
         LAND USE            GROUP  (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                   B      1.70      0.75       0.100    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =      1.70     SUBAREA RUNOFF(CFS) =     5.76
  EFFECTIVE AREA(ACRES) =      2.90   AREA-AVERAGED Fm(INCH/HR) =   0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =   0.10
  TOTAL AREA(ACRES) =        2.9        PEAK FLOW RATE(CFS) =      9.82


*****************************************************************************
  FLOW PROCESS FROM NODE      3.10 TO NODE      3.20 IS CODE =  91
-----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
=============================================================================
  UPSTREAM NODE ELEVATION(FEET) =     86.00
  DOWNSTREAM NODE ELEVATION(FEET) =      85.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   230.00
  "V" GUTTER WIDTH(FEET) =   3.00    GUTTER HIKE(FEET) =  0.200
  PAVEMENT LIP(FEET) =  0.030    MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =    0.50
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.512
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA       Fp        Ap      SCS
         LAND USE            GROUP  (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                   B      0.40      0.75       0.100    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     10.45
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.16
  AVERAGE FLOW DEPTH(FEET) =   0.50    FLOOD WIDTH(FEET) =   30.00
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.78   Tc(MIN.) =   12.95
  SUBAREA AREA(ACRES) =      0.40        SUBAREA RUNOFF(CFS) =    1.24
  EFFECTIVE AREA(ACRES) =      3.30     AREA-AVERAGED Fm(INCH/HR) =   0.07
  AREA-AVERAGED Fp(INCH/HR) =   0.75  AREA-AVERAGED Ap =   0.10
  TOTAL AREA(ACRES) =        3.3        PEAK FLOW RATE(CFS) =     10.21

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.50    FLOOD WIDTH(FEET) =   29.74
  FLOW VELOCITY(FEET/SEC.) =   2.14   DEPTH*VELOCITY(FT*FT/SEC) =   1.07
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.20 =    1134.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      3.20 TO NODE       3.20 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.) =   12.95
  RAINFALL INTENSITY(INCH/HR) =   3.51
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.75
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =        3.30
  TOTAL STREAM AREA(ACRES) =        3.30
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       10.21


****************************************************************************
  FLOW PROCESS FROM NODE      3.21 TO NODE       3.22 IS CODE =   21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   154.00
  ELEVATION DATA: UPSTREAM(FEET) =      89.00  DOWNSTREAM(FEET) =      87.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.435
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.914
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL    AREA       Fp        Ap     SCS    Tc
      LAND USE             GROUP     (ACRES)  (INCH/HR)  (DECIMAL)  CN   (MIN.)
  COMMERCIAL                 B        0.20      0.75      0.100     56    5.43
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =       1.05
  TOTAL AREA(ACRES) =        0.20   PEAK FLOW RATE(CFS) =       1.05


****************************************************************************
  FLOW PROCESS FROM NODE      3.22 TO NODE       3.23 IS CODE =   31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     85.00  DOWNSTREAM(FEET) =     84.00
  FLOW LENGTH(FEET) =     60.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.74
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.05
  PIPE TRAVEL TIME(MIN.) =   0.21    Tc(MIN.) =    5.65
  LONGEST FLOWPATH FROM NODE      3.21 TO NODE      3.23 =    214.00 FEET.


****************************************************************************
  FLOW PROCESS FROM NODE      3.23 TO NODE       3.23 IS CODE =   81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
```

```
================================================================================
  MAINLINE Tc(MIN.) =    5.65
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.781
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/        SCS SOIL    AREA        Fp        Ap      SCS
       LAND USE             GROUP     (ACRES)   (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                   B        0.30       0.75      0.100     56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =      0.30        SUBAREA RUNOFF(CFS) =     1.54
  EFFECTIVE AREA(ACRES) =        0.50    AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        0.5        PEAK FLOW RATE(CFS) =      2.57

****************************************************************************
  FLOW PROCESS FROM NODE    3.23 TO NODE      3.24 IS CODE =  31
--------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     84.00  DOWNSTREAM(FEET) =     82.00
  FLOW LENGTH(FEET) =    239.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =    4.51
  ESTIMATED PIPE DIAMETER(INCH) =  12.00     NUMBER OF PIPES =    1
  PIPE-FLOW(CFS) =       2.57
  PIPE TRAVEL TIME(MIN.) =   0.88    Tc(MIN.) =     6.53
  LONGEST FLOWPATH FROM NODE      3.21 TO NODE      3.24 =     453.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    3.24 TO NODE      3.24 IS CODE =  81
--------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
  MAINLINE Tc(MIN.) =    6.53
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.298
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/        SCS SOIL    AREA        Fp        Ap      SCS
       LAND USE             GROUP     (ACRES)   (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                   B        0.70       0.75      0.100     56
  COMMERCIAL                   B        0.20       0.75      0.100     56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =     0.90        SUBAREA RUNOFF(CFS) =     4.23
  EFFECTIVE AREA(ACRES) =        1.40    AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        1.4        PEAK FLOW RATE(CFS) =      6.58

****************************************************************************
  FLOW PROCESS FROM NODE    3.24 TO NODE      3.25 IS CODE =  31
--------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     82.00  DOWNSTREAM(FEET) =     80.00
  FLOW LENGTH(FEET) =    200.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.5 INCHES
```

```
   PIPE-FLOW VELOCITY(FEET/SEC.) =    6.15
   ESTIMATED PIPE DIAMETER(INCH) = 18.00     NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =        6.58
   PIPE TRAVEL TIME(MIN.) =   0.54    Tc(MIN.) =      7.07
   LONGEST FLOWPATH FROM NODE      3.21 TO NODE      3.25 =     653.00 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE      3.25 TO NODE      3.25 IS CODE =  81
----------------------------------------------------------------------------
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   MAINLINE Tc(MIN.) =    7.07
   * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.050
   SUBAREA LOSS RATE DATA(AMC  II):
    DEVELOPMENT TYPE/        SCS SOIL   AREA       Fp         Ap       SCS
       LAND USE             GROUP    (ACRES)  (INCH/HR)  (DECIMAL)   CN
   COMMERCIAL                 B        0.60      0.75       0.100     56
   COMMERCIAL                 B        0.20      0.75       0.100     56
   SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
   SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
   SUBAREA AREA(ACRES) =     0.80       SUBAREA RUNOFF(CFS) =     3.58
   EFFECTIVE AREA(ACRES) =       2.20    AREA-AVERAGED Fm(INCH/HR) =  0.07
   AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
   TOTAL AREA(ACRES) =        2.2       PEAK FLOW RATE(CFS) =      9.85


****************************************************************************
   FLOW PROCESS FROM NODE      3.25 TO NODE      3.26 IS CODE =  31
----------------------------------------------------------------------------
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =    80.00  DOWNSTREAM(FEET) =    79.00
   FLOW LENGTH(FEET) =    113.00    MANNING'S N =  0.013
   DEPTH OF FLOW IN  21.0 INCH PIPE IS  12.7 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =    6.49
   ESTIMATED PIPE DIAMETER(INCH) = 21.00     NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =        9.85
   PIPE TRAVEL TIME(MIN.) =   0.29    Tc(MIN.) =      7.36
   LONGEST FLOWPATH FROM NODE      3.21 TO NODE      3.26 =     766.00 FEET.


****************************************************************************
   FLOW PROCESS FROM NODE      3.26 TO NODE      3.26 IS CODE =  81
----------------------------------------------------------------------------
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   MAINLINE Tc(MIN.) =    7.36
   * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.930
   SUBAREA LOSS RATE DATA(AMC  II):
    DEVELOPMENT TYPE/        SCS SOIL   AREA       Fp         Ap       SCS
       LAND USE             GROUP    (ACRES)  (INCH/HR)  (DECIMAL)   CN
   COMMERCIAL                 B        0.40      0.75       0.100     56
   COMMERCIAL                 B        0.10      0.75       0.100     56
   SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
   SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
   SUBAREA AREA(ACRES) =     0.50       SUBAREA RUNOFF(CFS) =     2.18
   EFFECTIVE AREA(ACRES) =       2.70    AREA-AVERAGED Fm(INCH/HR) =  0.07
   AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
```

```
   TOTAL AREA(ACRES) =         2.7       PEAK FLOW RATE(CFS) =        11.80


******************************************************************************
   FLOW PROCESS FROM NODE       3.26 TO NODE        3.20 IS CODE =   31
------------------------------------------------------------------------------
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     79.00  DOWNSTREAM(FEET) =    77.00
   FLOW LENGTH(FEET) =   230.00   MANNING'S N =  0.013
   DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.5 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   6.68
   ESTIMATED PIPE DIAMETER(INCH) =  21.00     NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =       11.80
   PIPE TRAVEL TIME(MIN.) =   0.57   Tc(MIN.) =      7.94
   LONGEST FLOWPATH FROM NODE       3.21 TO NODE       3.20 =     996.00 FEET.


******************************************************************************
   FLOW PROCESS FROM NODE       3.20 TO NODE        3.20 IS CODE =    1
------------------------------------------------------------------------------
   >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
   >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
==============================================================================
   TOTAL NUMBER OF STREAMS =  2
   CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
   TIME OF CONCENTRATION(MIN.) =    7.94
   RAINFALL INTENSITY(INCH/HR) =   4.71
   AREA-AVERAGED Fm(INCH/HR) =  0.07
   AREA-AVERAGED Fp(INCH/HR) =  0.75
   AREA-AVERAGED Ap =  0.10
   EFFECTIVE STREAM AREA(ACRES) =        2.70
   TOTAL STREAM AREA(ACRES) =        2.70
   PEAK FLOW RATE(CFS) AT CONFLUENCE =      11.80

   ** CONFLUENCE DATA **
   STREAM      Q      Tc    Intensity    Fp(Fm)      Ap      Ae      HEADWATER
   NUMBER    (CFS)  (MIN.) (INCH/HR)   (INCH/HR)          (ACRES)     NODE
      1      10.21  12.95    3.512    0.75( 0.07) 0.10       3.3      1.00
      2      11.80   7.94    4.713    0.75( 0.07) 0.10       2.7      3.21

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

   ** PEAK FLOW RATE TABLE **
   STREAM      Q      Tc    Intensity    Fp(Fm)      Ap      Ae      HEADWATER
   NUMBER    (CFS)  (MIN.) (INCH/HR)   (INCH/HR)          (ACRES)     NODE
      1      20.24   7.94    4.713    0.75( 0.07) 0.10       4.7      3.21
      2      18.95  12.95    3.512    0.75( 0.07) 0.10       6.0      1.00

   COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
   PEAK FLOW RATE(CFS) =       20.24    Tc(MIN.) =      7.94
   EFFECTIVE AREA(ACRES) =        4.72   AREA-AVERAGED Fm(INCH/HR) =  0.07
   AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
   TOTAL AREA(ACRES) =        6.0
   LONGEST FLOWPATH FROM NODE       1.00 TO NODE       3.20 =   1134.00 FEET.


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

```
   FLOW PROCESS FROM NODE        3.20 TO NODE         3.30 IS CODE =  31
-----------------------------------------------------------------------------
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     77.00  DOWNSTREAM(FEET) =    76.00
   FLOW LENGTH(FEET) =     81.00   MANNING'S N =  0.013
   DEPTH OF FLOW IN  24.0 INCH PIPE IS  16.6 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   8.71
   ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =       20.24
   PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =    8.09
   LONGEST FLOWPATH FROM NODE       1.00 TO NODE       3.30 =    1215.00 FEET.


*****************************************************************************
   FLOW PROCESS FROM NODE        3.30 TO NODE         3.30 IS CODE =  81
-----------------------------------------------------------------------------
   >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=============================================================================
   MAINLINE Tc(MIN.) =    8.09
   * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.658
   SUBAREA LOSS RATE DATA(AMC  II):
    DEVELOPMENT TYPE/       SCS SOIL    AREA       Fp        Ap      SCS
        LAND USE           GROUP     (ACRES)  (INCH/HR)  (DECIMAL)  CN
   COMMERCIAL                B         2.80      0.75       0.100     56
   COMMERCIAL                B         1.00      0.75       0.100     56
   SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
   SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
   SUBAREA AREA(ACRES) =    3.80        SUBAREA RUNOFF(CFS) =   15.68
   EFFECTIVE AREA(ACRES) =      8.52    AREA-AVERAGED Fm(INCH/HR) =  0.07
   AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
   TOTAL AREA(ACRES) =      9.8        PEAK FLOW RATE(CFS) =     35.15


*****************************************************************************
   FLOW PROCESS FROM NODE        3.30 TO NODE         3.00 IS CODE =  31
-----------------------------------------------------------------------------
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     76.00  DOWNSTREAM(FEET) =    73.00
   FLOW LENGTH(FEET) =     46.00   MANNING'S N =  0.013
   DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.4 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =  18.54
   ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =       35.15
   PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    8.13
   LONGEST FLOWPATH FROM NODE       1.00 TO NODE       3.00 =    1261.00 FEET.


*****************************************************************************
   FLOW PROCESS FROM NODE        3.00 TO NODE         3.00 IS CODE =  11
-----------------------------------------------------------------------------
   >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
=============================================================================

   ** MAIN STREAM CONFLUENCE DATA **
    STREAM      Q      Tc    Intensity   Fp(Fm)     Ap      Ae     HEADWATER
    NUMBER    (CFS)  (MIN.) (INCH/HR)   (INCH/HR)          (ACRES)    NODE
```

```
     1        35.15    8.13   4.644  0.75( 0.07) 0.10          8.5        3.21
     2        30.10   13.15   3.480  0.75( 0.07) 0.10          9.8        1.00
LONGEST FLOWPATH FROM NODE        1.00 TO NODE       3.00 =    1261.00 FEET.


  ** MEMORY BANK #  1 CONFLUENCE DATA **
   STREAM      Q      Tc    Intensity  Fp(Fm)    Ap     Ae    HEADWATER
   NUMBER    (CFS)  (MIN.)  (INCH/HR) (INCH/HR)      (ACRES)    NODE
     1         3.38   12.28   3.626  0.75( 0.07) 0.10          0.9        1.00
LONGEST FLOWPATH FROM NODE        1.00 TO NODE       3.00 =    1375.00 FEET.


  ** PEAK FLOW RATE TABLE **
   STREAM      Q      Tc    Intensity  Fp(Fm)    Ap     Ae    HEADWATER
   NUMBER    (CFS)  (MIN.)  (INCH/HR) (INCH/HR)      (ACRES)    NODE
     1        38.03    8.13   4.644  0.75( 0.07) 0.10          9.1        3.21
     2        34.35   12.28   3.626  0.75( 0.07) 0.10         10.5        1.00
     3        33.34   13.15   3.480  0.75( 0.07) 0.10         10.7        1.00
    TOTAL AREA(ACRES) =        10.7


  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =        38.03   Tc(MIN.) =      8.132
  EFFECTIVE AREA(ACRES) =       9.12   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.75   AREA-AVERAGED Ap =   0.10
  TOTAL AREA(ACRES) =        10.7
  LONGEST FLOWPATH FROM NODE        1.00 TO NODE       3.00 =    1375.00 FEET.


****************************************************************************
  FLOW PROCESS FROM NODE       3.00 TO NODE       4.00 IS CODE =   31
--------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     73.00  DOWNSTREAM(FEET) =    72.50
  FLOW LENGTH(FEET) =     64.00    MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  23.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =    8.59
  ESTIMATED PIPE DIAMETER(INCH) = 33.00     NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        38.03
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =      8.26
  LONGEST FLOWPATH FROM NODE        1.00 TO NODE       4.00 =    1439.00 FEET.


****************************************************************************
  FLOW PROCESS FROM NODE       4.00 TO NODE       4.00 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.) =    8.26
  RAINFALL INTENSITY(INCH/HR) =   4.60
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.75
  AREA-AVERAGED Ap =   0.10
  EFFECTIVE STREAM AREA(ACRES) =        9.12
  TOTAL STREAM AREA(ACRES) =       10.70
  PEAK FLOW RATE(CFS) AT CONFLUENCE =        38.03


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

```
  FLOW PROCESS FROM NODE       4.10 TO NODE        4.20 IS CODE =   21
-----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   714.00
  ELEVATION DATA: UPSTREAM(FEET) =      92.00  DOWNSTREAM(FEET) =     86.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.951
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.885
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp        Ap     SCS    Tc
        LAND USE            GROUP   (ACRES)  (INCH/HR) (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  B       3.20     0.75      0.100    56   10.95
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      10.97
  TOTAL AREA(ACRES) =        3.20   PEAK FLOW RATE(CFS) =      10.97

*****************************************************************************
  FLOW PROCESS FROM NODE       4.20 TO NODE        4.00 IS CODE =   31
-----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =      81.00  DOWNSTREAM(FEET) =     72.50
  FLOW LENGTH(FEET) =   222.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  11.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.34
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       10.97
  PIPE TRAVEL TIME(MIN.) =   0.33   Tc(MIN.) =   11.28
  LONGEST FLOWPATH FROM NODE       4.10 TO NODE        4.00 =    936.00 FEET.

*****************************************************************************
  FLOW PROCESS FROM NODE       4.00 TO NODE        4.00 IS CODE =    1
-----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
=============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.28
  RAINFALL INTENSITY(INCH/HR) =   3.82
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.75
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.20
  TOTAL STREAM AREA(ACRES) =       3.20
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       10.97

  ** CONFLUENCE DATA **
   STREAM      Q      Tc   Intensity  Fp(Fm)     Ap      Ae     HEADWATER
   NUMBER    (CFS)  (MIN.) (INCH/HR)  (INCH/HR)        (ACRES)    NODE
      1      38.03   8.26    4.602   0.75( 0.07) 0.10     9.1       3.21
      1      34.35  12.41    3.603   0.75( 0.07) 0.10    10.5       1.00
```

```
      1         33.34   13.28    3.460  0.75( 0.07) 0.10       10.7       1.00
      2         10.97   11.28    3.817  0.75( 0.07) 0.10        3.2       4.10

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

   ** PEAK FLOW RATE TABLE **
    STREAM      Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
    NUMBER    (CFS)  (MIN.) (INCH/HR)  (INCH/HR)        (ACRES)   NODE
      1       47.75   8.26    4.602  0.75( 0.07) 0.10       11.5       3.21
      2       46.33   11.28   3.817  0.75( 0.07) 0.10       13.3       4.10
      3       44.70   12.41   3.603  0.75( 0.07) 0.10       13.7       1.00
      4       43.26   13.28   3.460  0.75( 0.07) 0.10       13.9       1.00

   COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
   PEAK FLOW RATE(CFS) =      47.75    Tc(MIN.) =      8.26
   EFFECTIVE AREA(ACRES) =      11.46   AREA-AVERAGED Fm(INCH/HR) =  0.07
   AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
   TOTAL AREA(ACRES) =       13.9
   LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =   1439.00 FEET.

***************************************************************************
   FLOW PROCESS FROM NODE    4.00 TO NODE      5.00 IS CODE =  31
--------------------------------------------------------------------------
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
   ELEVATION DATA: UPSTREAM(FEET) =     72.50  DOWNSTREAM(FEET) =    72.00
   FLOW LENGTH(FEET) =   278.00   MANNING'S N =  0.013
   DEPTH OF FLOW IN  45.0 INCH PIPE IS  35.2 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =   5.15
   ESTIMATED PIPE DIAMETER(INCH) =  45.00    NUMBER OF PIPES =   1
   PIPE-FLOW(CFS) =       47.75
   PIPE TRAVEL TIME(MIN.) =   0.90    Tc(MIN.) =      9.16
   LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =   1717.00 FEET.

***************************************************************************
   FLOW PROCESS FROM NODE    5.00 TO NODE      5.00 IS CODE =   1
--------------------------------------------------------------------------
   >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==========================================================================
   TOTAL NUMBER OF STREAMS =  2
   CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
   TIME OF CONCENTRATION(MIN.) =    9.16
   RAINFALL INTENSITY(INCH/HR) =   4.33
   AREA-AVERAGED Fm(INCH/HR) =  0.07
   AREA-AVERAGED Fp(INCH/HR) =  0.75
   AREA-AVERAGED Ap =  0.10
   EFFECTIVE STREAM AREA(ACRES) =      11.46
   TOTAL STREAM AREA(ACRES) =      13.90
   PEAK FLOW RATE(CFS) AT CONFLUENCE =      47.75

***************************************************************************
   FLOW PROCESS FROM NODE    5.10 TO NODE      5.20 IS CODE =  21
--------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
   >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
```

```
================================================================================
   INITIAL SUBAREA FLOW-LENGTH(FEET) =    267.00
   ELEVATION DATA: UPSTREAM(FEET) =      88.00  DOWNSTREAM(FEET) =      85.00


  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.972
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.093
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp        Ap      SCS    Tc
       LAND USE           GROUP    (ACRES)  (INCH/HR)  (DECIMAL)  CN   (MIN.)
  COMMERCIAL                B       2.00      0.75      0.100     56    6.97
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =        9.03
  TOTAL AREA(ACRES) =       2.00    PEAK FLOW RATE(CFS) =       9.03


*******************************************************************************
  FLOW PROCESS FROM NODE     5.20 TO NODE       5.00 IS CODE =   31
--------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =      80.00  DOWNSTREAM(FEET) =      72.00
  FLOW LENGTH(FEET) =      51.00    MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  18.68
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        9.03
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =      7.02
  LONGEST FLOWPATH FROM NODE      5.10 TO NODE       5.00 =     318.00 FEET.


*******************************************************************************
  FLOW PROCESS FROM NODE     5.00 TO NODE       5.00 IS CODE =    1
--------------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.02
  RAINFALL INTENSITY(INCH/HR) =   5.07
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.75
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       2.00
  TOTAL STREAM AREA(ACRES) =       2.00
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       9.03

  ** CONFLUENCE DATA **
   STREAM      Q      Tc    Intensity  Fp(Fm)     Ap      Ae      HEADWATER
   NUMBER    (CFS)  (MIN.) (INCH/HR)  (INCH/HR)         (ACRES)     NODE
      1      47.75   9.16    4.325   0.75( 0.07) 0.10     11.5       3.21
      1      46.33  12.18    3.645   0.75( 0.07) 0.10     13.3       4.10
      1      44.70  13.32    3.454   0.75( 0.07) 0.10     13.7       1.00
      1      43.26  14.19    3.325   0.75( 0.07) 0.10     13.9       1.00
      2       9.03   7.02    5.074   0.75( 0.07) 0.10      2.0       5.10
```

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

** PEAK FLOW RATE TABLE **
 STREAM     Q      Tc   Intensity   Fp(Fm)     Ap      Ae      HEADWATER
 NUMBER   (CFS)  (MIN.) (INCH/HR)  (INCH/HR)        (ACRES)      NODE
    1     52.08   7.02    5.074   0.75( 0.07)  0.10     10.8        5.10
    2     55.43   9.16    4.325   0.75( 0.07)  0.10     13.5        3.21
    3     52.78  12.18    3.645   0.75( 0.07)  0.10     15.3        4.10
    4     50.80  13.32    3.454   0.75( 0.07)  0.10     15.7        1.00
    5     49.14  14.19    3.325   0.75( 0.07)  0.10     15.9        1.00


COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =        55.43    Tc(MIN.) =       9.16
EFFECTIVE AREA(ACRES) =      13.46   AREA-AVERAGED Fm(INCH/HR) =  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
TOTAL AREA(ACRES) =        15.9
LONGEST FLOWPATH FROM NODE      1.00 TO NODE       5.00 =   1717.00 FEET.

***************************************************************************
 FLOW PROCESS FROM NODE     5.00 TO NODE       6.00 IS CODE =   31
---------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
===========================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    72.00  DOWNSTREAM(FEET) =    71.00
 FLOW LENGTH(FEET) =   215.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  42.0 INCH PIPE IS  29.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.77
 ESTIMATED PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       55.43
 PIPE TRAVEL TIME(MIN.) =   0.46   Tc(MIN.) =       9.62
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE       6.00 =   1932.00 FEET.

***************************************************************************
 FLOW PROCESS FROM NODE     6.00 TO NODE       6.00 IS CODE =   81
---------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
===========================================================================
 MAINLINE Tc(MIN.) =    9.62
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.200
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL    AREA       Fp         Ap      SCS
     LAND USE             GROUP    (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 B        1.00       0.75      0.100     56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    1.00       SUBAREA RUNOFF(CFS) =    3.71
 EFFECTIVE AREA(ACRES) =     14.46   AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =       16.9       PEAK FLOW RATE(CFS) =      55.43
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
===========================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =       16.9 TC(MIN.) =       9.62
 EFFECTIVE AREA(ACRES) =     14.46 AREA-AVERAGED Fm(INCH/HR)=  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.100
```

```
     PEAK FLOW RATE(CFS)    =        55.43

     ** PEAK FLOW RATE TABLE **
      STREAM       Q      Tc    Intensity   Fp(Fm)      Ap     Ae      HEADWATER
      NUMBER     (CFS)  (MIN.) (INCH/HR)  (INCH/HR)           (ACRES)    NODE
         1       52.08   7.49    4.878    0.75( 0.07) 0.10     11.8       5.10
         2       55.43   9.62    4.200    0.75( 0.07) 0.10     14.5       3.21
         3       52.78  12.65    3.562    0.75( 0.07) 0.10     16.3       4.10
         4       50.80  13.80    3.382    0.75( 0.07) 0.10     16.7       1.00
         5       49.14  14.67    3.259    0.75( 0.07) 0.10     16.9       1.00
==============================================================================

==============================================================================
     END OF RATIONAL METHOD ANALYSIS
```

REFERENCES & MAPS

SITE

SAN BERNARDINO COUNTY
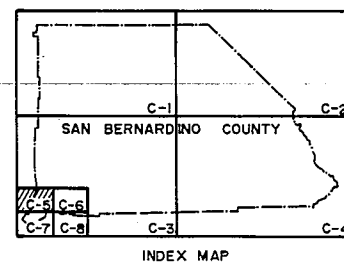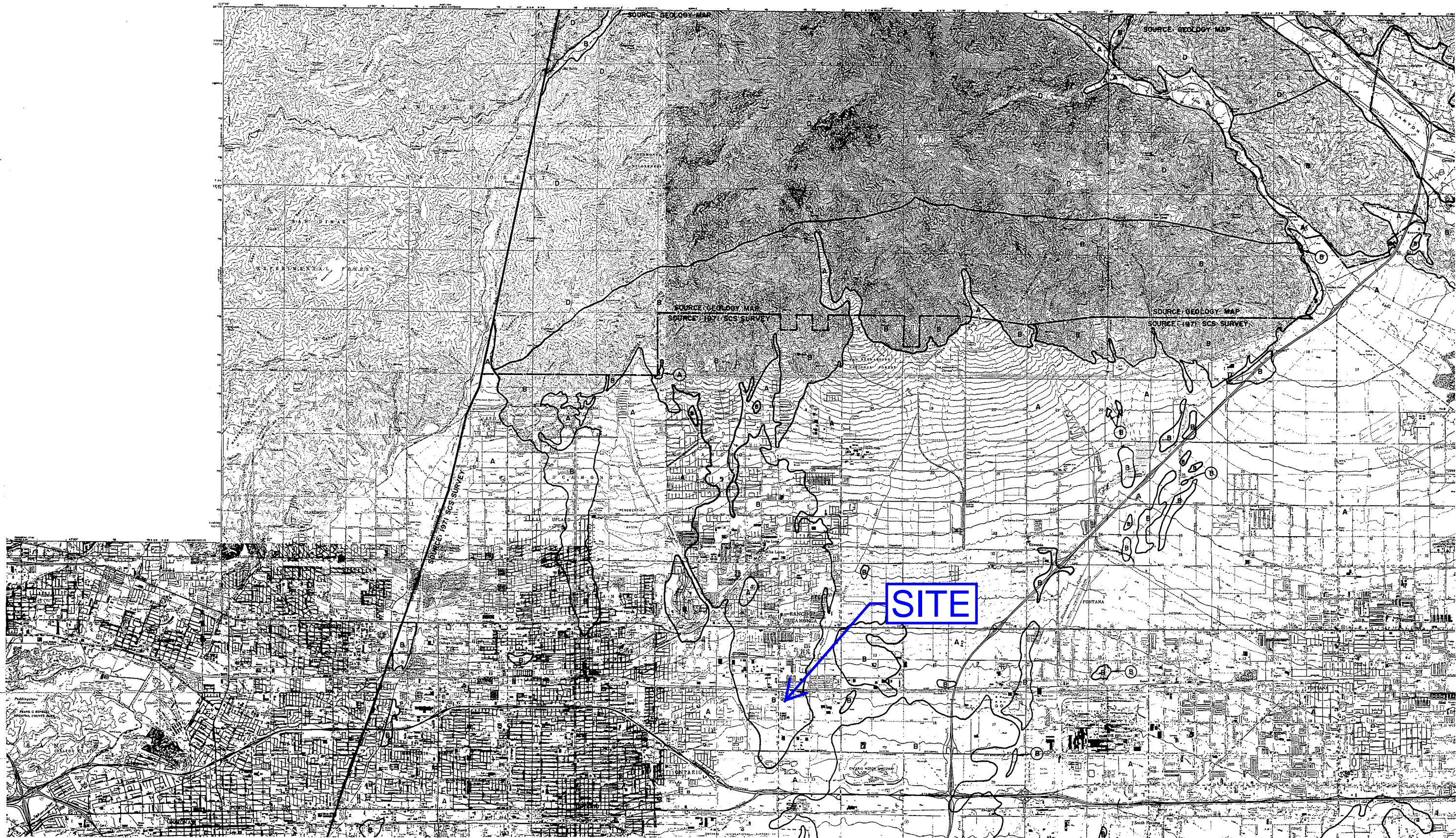
HYDROLOGY MANUAL

LEGEND

———————— SOIL GROUP BOUNDARY

A SOIL GROUP DESIGNATION

————————— BOUNDARY OF INDICATED SOURCE

SCALE 1:48,000

SCALE REDUCED BY 1/2

HYDROLOGIC SOILS GROUP MAP
FOR
SOUTHWEST-A AREA

INDEX MAP

SAN BERNARDINO COUNTY

FIGURE C-13

SITE

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

REDUCED DRAWING
SCALE 1" = 4 MILES

LEGEND:
1.8 ISOLINES PRECIPITATION (INCHES)

SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

VALLEY AREA
ISOHYETALS
Y₁₀₀ -100 YEAR 1 HOUR
BASED ON U.S.D.C. NOAA ATLAS 2, 1973

APPROVED BY			
FLOOD CONTROL ENGINEER			
DATE	SCALE	FILE NO.	DWG. NO.
1982	1"=2 MI.	WRO-1	4 of 12

B-12   FIGURE B-4