APPENDIX H1

PRELIMINARY HYDROLOGY CALCULATIONS

PRELIMINARY HYDROLOGY CALCULATIONS

FOR

GATEWAY SOUTH BUILDING 4
WATERMAN AVENUE
SAN BERNARDINO, CALIFORNIA

PREPARED FOR

HILLWOOD INVESTMENTS
301 VIA PIEMONTE, SUITE 175
ONTARIO CA 91764
(909) 382-0033

OCTOBER 28, 2016
REVISED MARCH 20107

JOB NO. 3412

PREPARED BY

THIENES ENGINEERING
14349 FIRESTONE BLVD.
LA MIRADA, CALIFORNIA 90638
(714) 521-4811

PRELIMINARY HYDROLOGY CALCULATIONS

FOR

GATEWAY SOUTH BUILDING 4

PREPARED BY BRIAN WEIL
UNDER THE SUPERVISION OF

HAIDOOK AGHAIAN DATE:
R.C.E. 43293
EXP. 03/31/18

APPENDIX	DESCRIPTION
A	REFERENCE MATERIALS
B	HYDROLOGY CALCULATIONS
C	HYDRAULIC CALCULATIONS
D	DETENTION CALCULATIONS
E	HYDROLOGY MAPS

INTRODUCTION

A: PROJECT LOCATION

The project site is on the west side of Waterman Avenue between East Dumas Street and the Santa Ana River. Twin Creek is to the west of the project site. Please see Figure 1 for vicinity map.

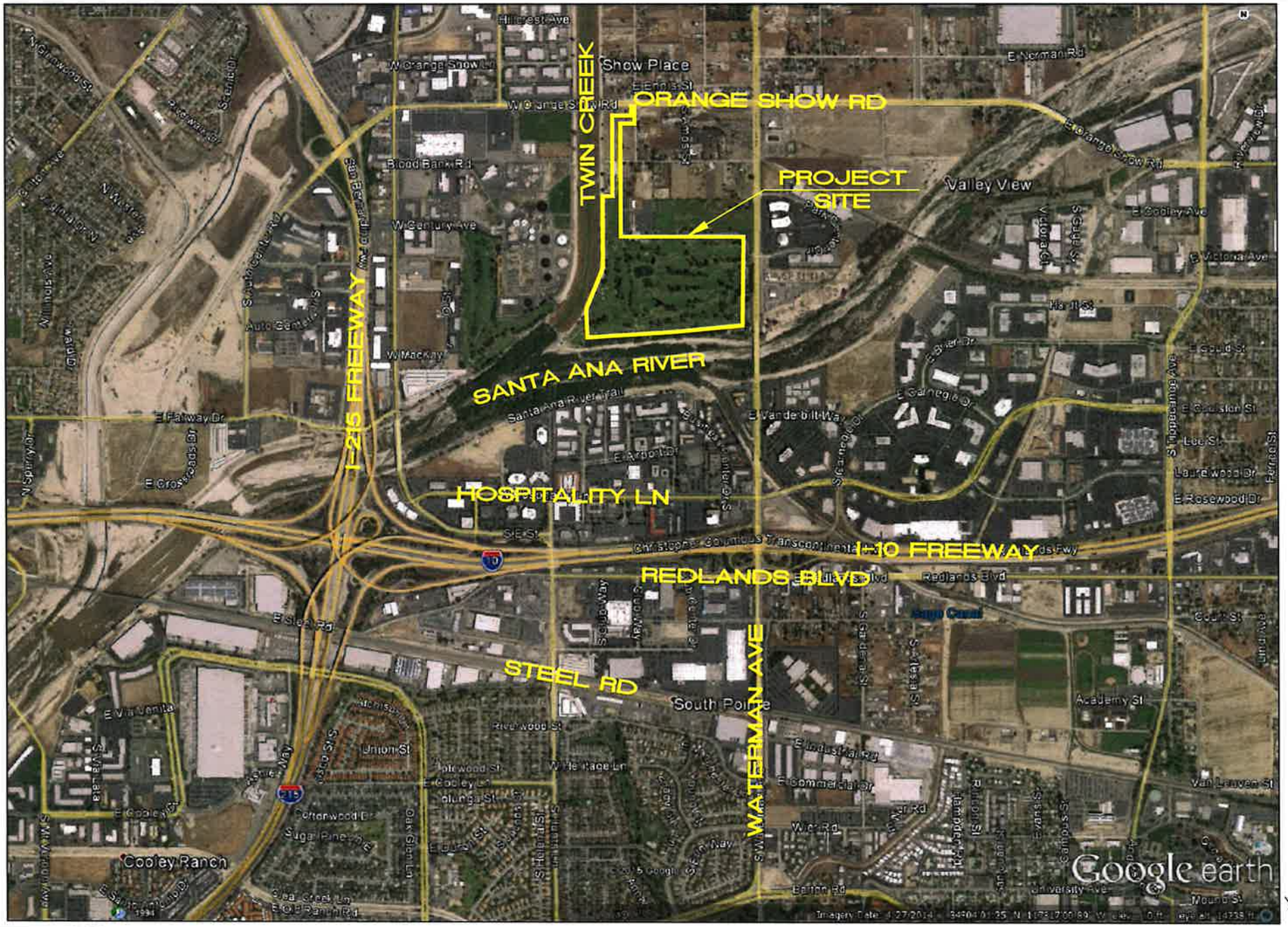
B: STUDY PURPOSE

The purpose of this study is to determine the proposed condition 100-year peak flow rate from the site that will ultimately drain to Santa Ana River.

C: PROJECT STAFF:

Thienes Engineering staff involved in this study include:

Haidook Aghaian, PE
Brian Weil
Kristie Ferronato, PE



Last Update: 3/23/17
O:\3400-3499\3412\3412VicMap.dwg

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VICINITY MAP

FOR

GATEWAY SOUTH BUILDING 4

DISCUSSION

The proposed commercial site encompasses approximately 62.1 acres. Proposed improvements to the site consist of one large commercial building with approximately 1,065,000 square feet. Truck yard areas are located on both the northerly and southerly sides of the proposed building. Parking areas are located on the westerly and easterly sides of the building with a larger parking area at the northerly portion of the site. A paved access road will be constructed connecting the site to Orange Show Road. There will be landscaping around the perimeter of the site along with an earthen water quality basin at the southwest corner of the site.

Existing Condition

The site is currently developed as a golf course. The site is generally grass with the exception of the access roads, parking area and club house. Runoff from the southerly 2/3 of the site (nodes 100-125 on existing condition hydrology map) generally drains southwesterly towards the Santa Ana River via several natural drainage courses. The existing condition 100-year peak flow rates towards the River are 10.9 cfs (at node 125), 9.9 cfs (at node 112) and 16.6 cfs (at node 106).

Runoff from the existing drive aisle, the parking lot, club house and areas west of the clubhouse (nodes 200-205) drain westerly toward Twin Creek. The 100-year peak flow rate for this area is approximately 18.8 cfs.

This entire area (offsite and onsite) is table to Santa Ana River as area 65A-8 from the comprehensive storm drain plan (see appendix A)

Offsite Areas

Under existing conditions, portions of the golf course and existing large residential lots north of the golf course drain onto the limits of the proposed project site. An area north of the project site (nodes 300-302 on existing condition hydrology map) drains to a low point near the northerly property line. Higher runoff eventually spills over to the proposed project site. The 100-year peak flow rate for this area is approximately 7.0 cfs.

Additional offsite areas come from the existing residential lots north of the golf course. These areas (nodes 310-314) generally drain from east to west towards the area where the future access road to Dumas Street is located. There is a small v-channel at this location that conveys runoff southerly onto the existing golf course. The 100-year peak flow rate at this location is approximately 29.7 cfs.

The offsite area north of Dumas Street (nodes 400-413) drains westerly towards Twin Creek. The proposed access road will block the existing drainage path. However, near Dumas Street, a double 6'x1' reinforced concrete box will be constructed. This will

allow the drainage from this area to continue to Twin Creek to as it does in the existing condition. The 100-year peak flow rate at this location is approximately 47.8 cfs.

The proposed access road will be constructed with two low flow catch basins to collect the required water quality volume. This runoff will conveyed to the on-site water quality basin for treatment.

Offsite areas were modeled separately since these flows will be intercepted prior to entering the site. A separate storm drain system will convey runoff easterly to Santa Ana River without comingling with the project site runoff.

Proposed Condition

Runoff from the northerly half of the building and northerly truck yard (nodes 100-106 on proposed condition hydrology map) drains westerly through the truck yard to catch basins located near the westerly property line. A storm drain conveys this runoff along with flow from the northerly parking area (nodes 110-114) southerly to the proposed water quality basin located at the southwest corner of the project site. The 100-year peak flow rate for this area is approximately 79.7 cfs.

Runoff from the southerly half of the building, the majority of the easterly parking lot and the truck yard south of the building (nodes 120-126) drains westerly to catch basins located at the southwesterly corner of the site. Here, a storm drain conveys runoff to the water quality basin. The 100-year peak flow rate at this area is approximately 53.3 cfs.

All runoff from entire site ultimately drains to the basin at the southwest corner of the site. The total 100-year peak flow rate, including the basin, is approximately 130.2 cfs. A proposed storm drain will convey runoff to Santa Ana River, along with the runoff from the offsite properties to the north (nodes 300-303 and 310-314).

A swale is proposed around the northerly portion of the site (nodes 300-303 and 310-314) to convey this runoff to proposed C.M.P. risers located near the easterly property line. Here, a storm drain will convey offsite runoff directly to Santa Ana River without comingling with the project site. The 100-year peak flow rate for offsite areas at this location is approximately 38.8 cfs (30.4 cfs + 8.4 cfs).

The total discharge from the proposed storm drain will be 80.9 cfs (42.1 cfs (see detention section) + 38.8 cfs). This entire area (offsite and onsite) is tabled to Santa Ana River as area 65A-8.

Please see Appendix "B" for proposed and existing condition hydrology calculations and Appendix "D" for Hydrology maps.

Detention

The site will be developed with a water quality/detention basin in the southwest corner. This basin will not only provide the required water quality volume, it will also provide peak flow mitigation. The proposed runoff from the site will all be routed to the basin. The peak discharge from the basin is approximately 42 cfs. This will be combined with the off-site flow from the areas north of the project but south of Dumas (nodes 300-302 and 310-314) prior to discharge from the site.

The proposed storm drain outlet will be constructed entirely on site. The outlet location is behind the interim condition levee along the Santa Ana River. The runoff is generally allowed to disperse in this area behind the levee as it does in the existing condition. The discharge point is approximately 20 feet from any environmental sensitive areas as determined by the environmental consultants.

Summary

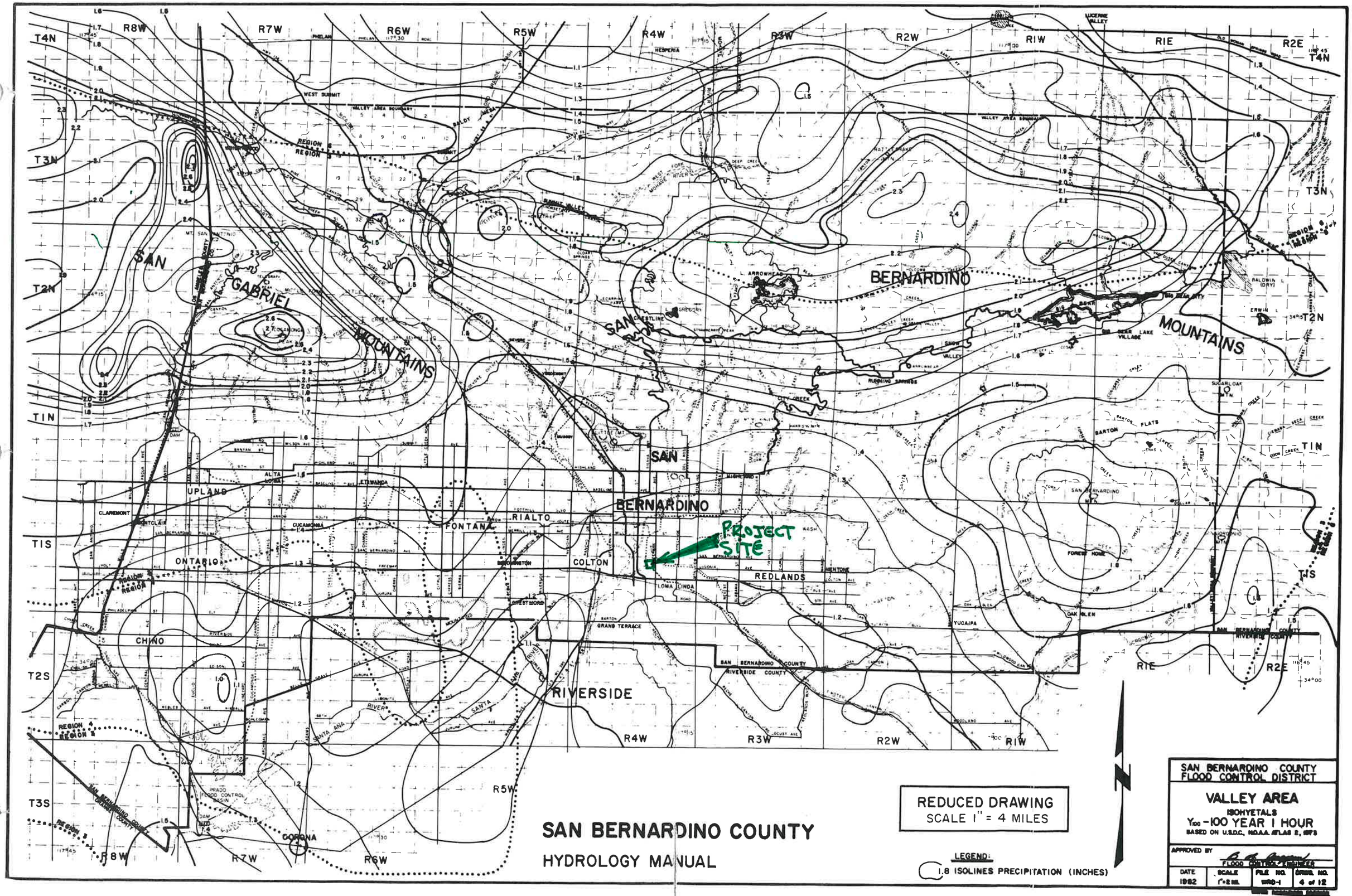
The project development will not have a negative effect on the downstream facilities. The total peak flow for the project site in the existing condition is 56.2 cfs. The proposed discharge from the basin is 42.1 cfs, this is a 75% reduction of the existing condition.

Methodology

Hydrology calculations were computed using San Bernardino County Rational Method Program (by AES Software). The soil type is "A" per the San Bernardino County Hydrology Manual.

APPENDIX A

REFERENCE MATERIALS



SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

REDUCED DRAWING
SCALE 1" = 4 MILES

LEGEND:
1.8 ISOLINES PRECIPITATION (INCHES)

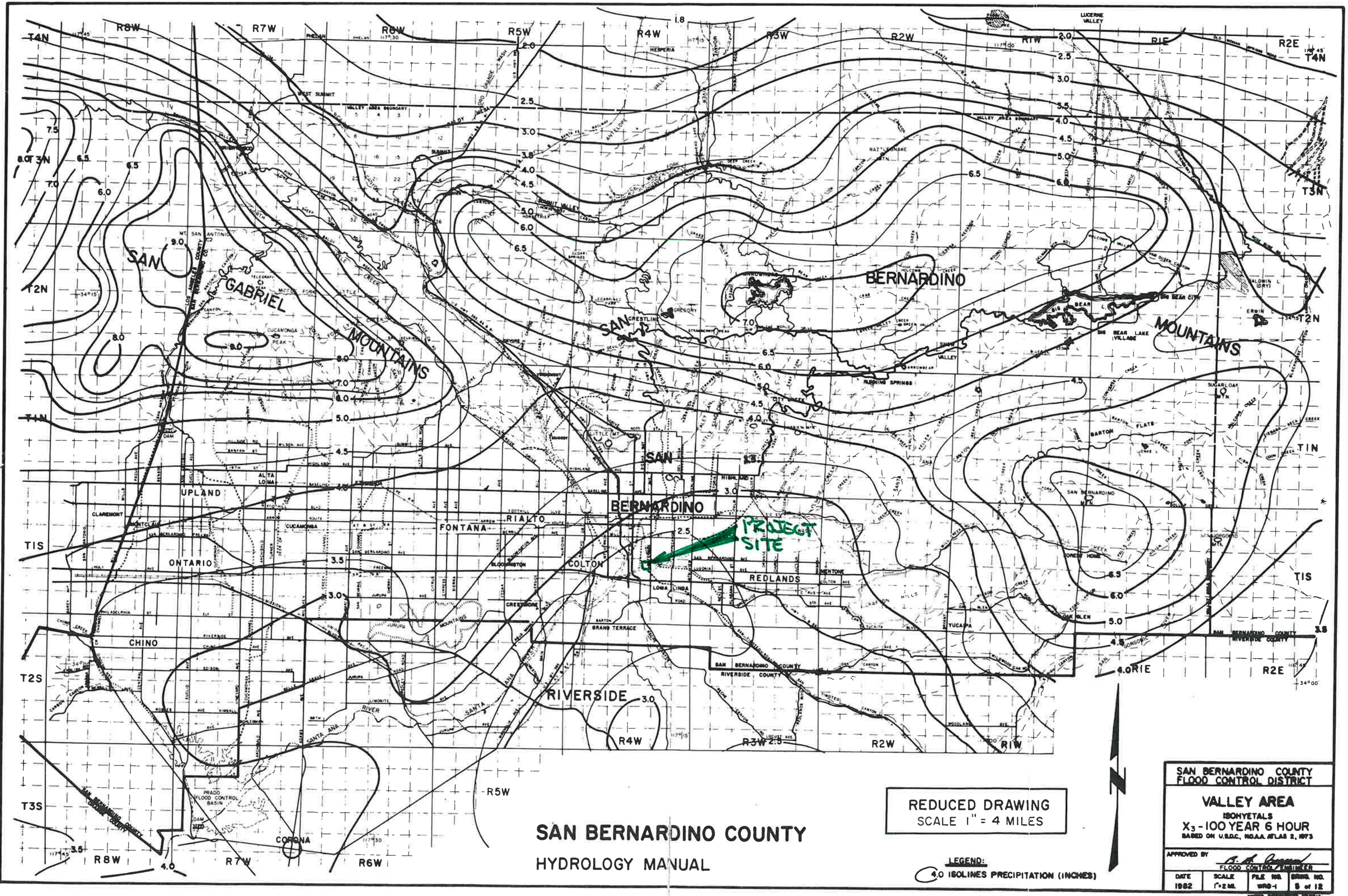
SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

VALLEY AREA
ISOHYETALS
Y_{100} - 100 YEAR 1 HOUR
BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973

APPROVED BY _____ FLOOD CONTROL ENGINEER

DATE	SCALE	FILE NO.	DRWG. NO.
1982	1"=2 MI.	WRD-1	4 of 12

FIGURE B-4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R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E
T4N
T3N
T2N
T1N
T1S
T2S
T3S
SAN GABRIEL MOUNTAINS
SAN BERNARDINO MOUNTAINS
MT. SAN ANTONIO
UPLAND
CLAREMONT
ALTA LOMA
CUCAMONGA
ONTARIO
CHINO
FONTANA
RIALTO
COLTON
SAN BERNARDINO
REDLANDS
LOMA LINDA
HIGHLAND
CRESTLINE
RIVERSIDE
CORONA
HESPERIA
LUCERNE VALLEY
BIG BEAR LAKE
BIG BEAR CITY
ARROWBEAR
SUGARLOAD
BARTON FLATS
YUCAIPA
PROJECT SITE
SANTA ANA RIVER
PRADO FLOOD CONTROL BASIN
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY
LOS ANGELES COUNTY
SAN BERNARDINO COUNTY
HYDROLOGY MANUAL
REDUCED DRAWING
SCALE 1" = 4 MILES
LEGEND:
4.0 ISOLINES PRECIPITATION (INCHES)
SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT
VALLEY AREA
ISOHYETALS
X3 - 100 YEAR 6 HOUR
BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973
APPROVED BY
FLOOD CONTROL ENGINEER
DATE 1982
SCALE 1"=2 MI.
FILE NO. VHD-1
DRWG. NO. 5 of 12

FIGURE B-5

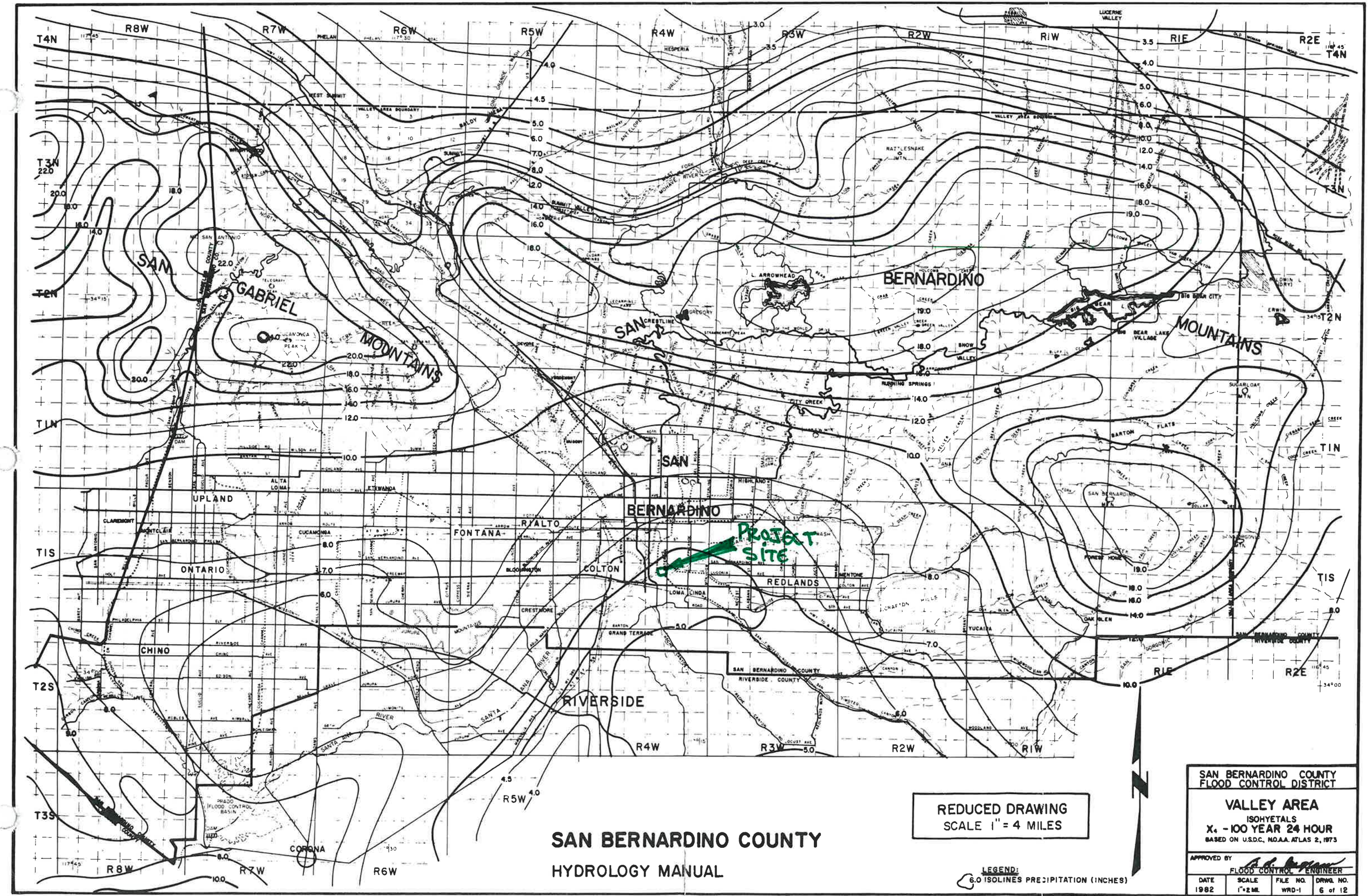
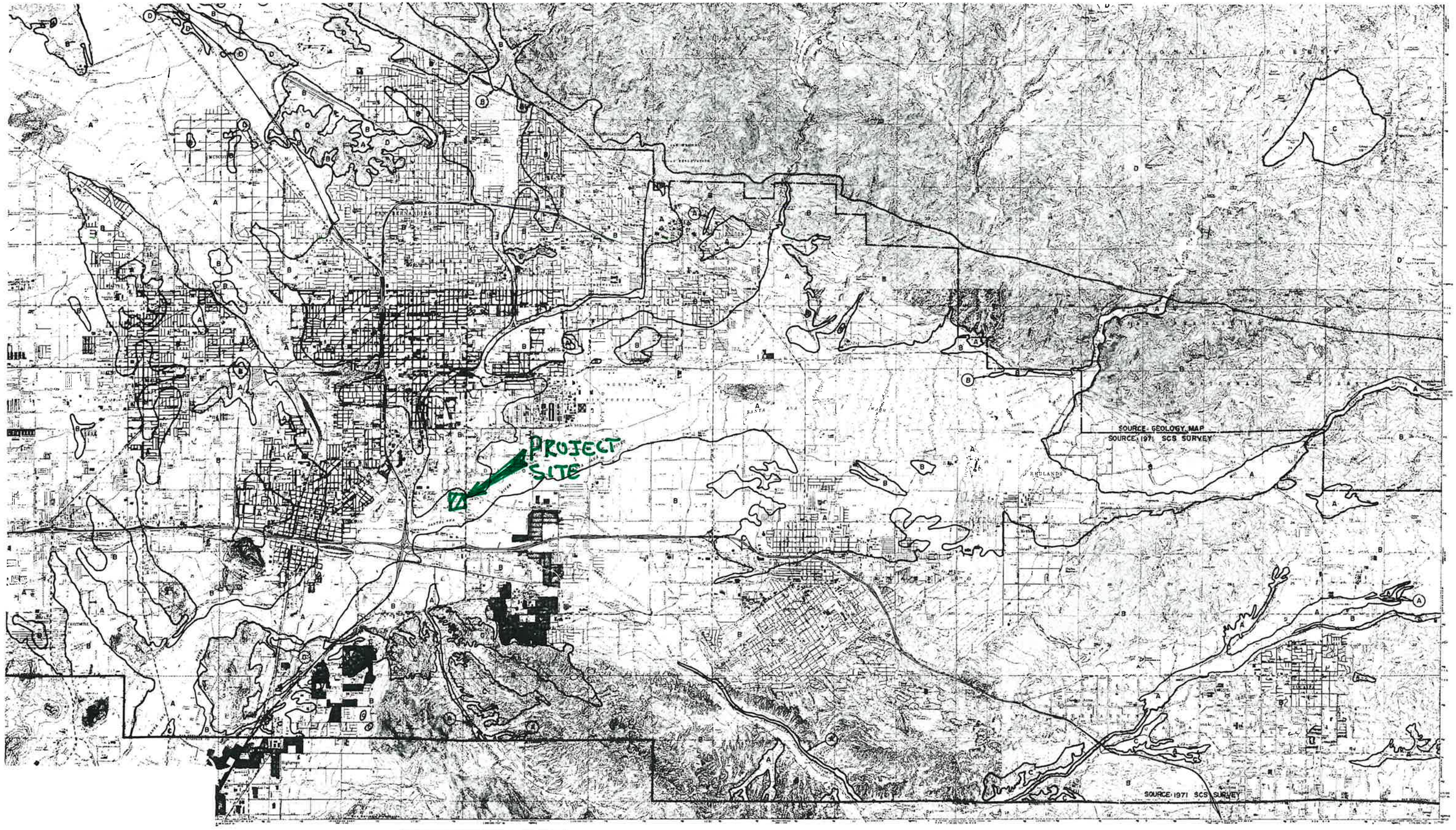
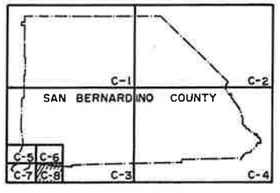

T4N
R8W
R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E
T3N
T2N
T1N
T1S
T2S
T3S
SAN GABRIEL MOUNTAINS
SAN BERNARDINO MOUNTAINS
SAN BERNARDINO
UPLAND
ONTARIO
CHINO
CLAREMONT
ALTA LOMA
ETIWANDA
RANCHO CUCAMONGA
FONTANA
RIALTO
COLTON
REDLANDS
LOMA LINDA
CRESTMORE
GRAND TERRACE
YUCAIPA
CALIMESA
BLOOMINGTON
RIVERSIDE
CORONA
PRADO FLOOD CONTROL BASIN
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY
L. ARROWHEAD
L. GREGORY
CRESTLINE
RUNNING SPRINGS
SNOW VALLEY
BIG BEAR LAKE
BIG BEAR CITY
BIG BEAR LAKE VILLAGE
ERWIN L.
SUGARLOAD MTN.
SAN BERNARDINO MTN.
RATTLESNAKE MTN.
HESPERIA
PHELAN
WEST SUMMIT
LUCERNE VALLEY
PROJECT SITE
SAN BERNARDINO COUNTY
HYDROLOGY MANUAL
REDUCED DRAWING
SCALE 1" = 4 MILES
LEGEND:
6.0 ISOLINES PRECIPITATION (INCHES)
SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT
VALLEY AREA
ISOHYETALS
X4 - 100 YEAR 24 HOUR
BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973
APPROVED BY
FLOOD CONTROL ENGINEER
DATE 1982
SCALE 1"=2 MI.
FILE NO. WRD-1
DRWG. NO. 6 of 12

FIGURE B-6



SAN BERNARDINO COUNTY
HYDROLOGY MANUAL



INDEX MAP

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-D AREA

FIGURE C-16

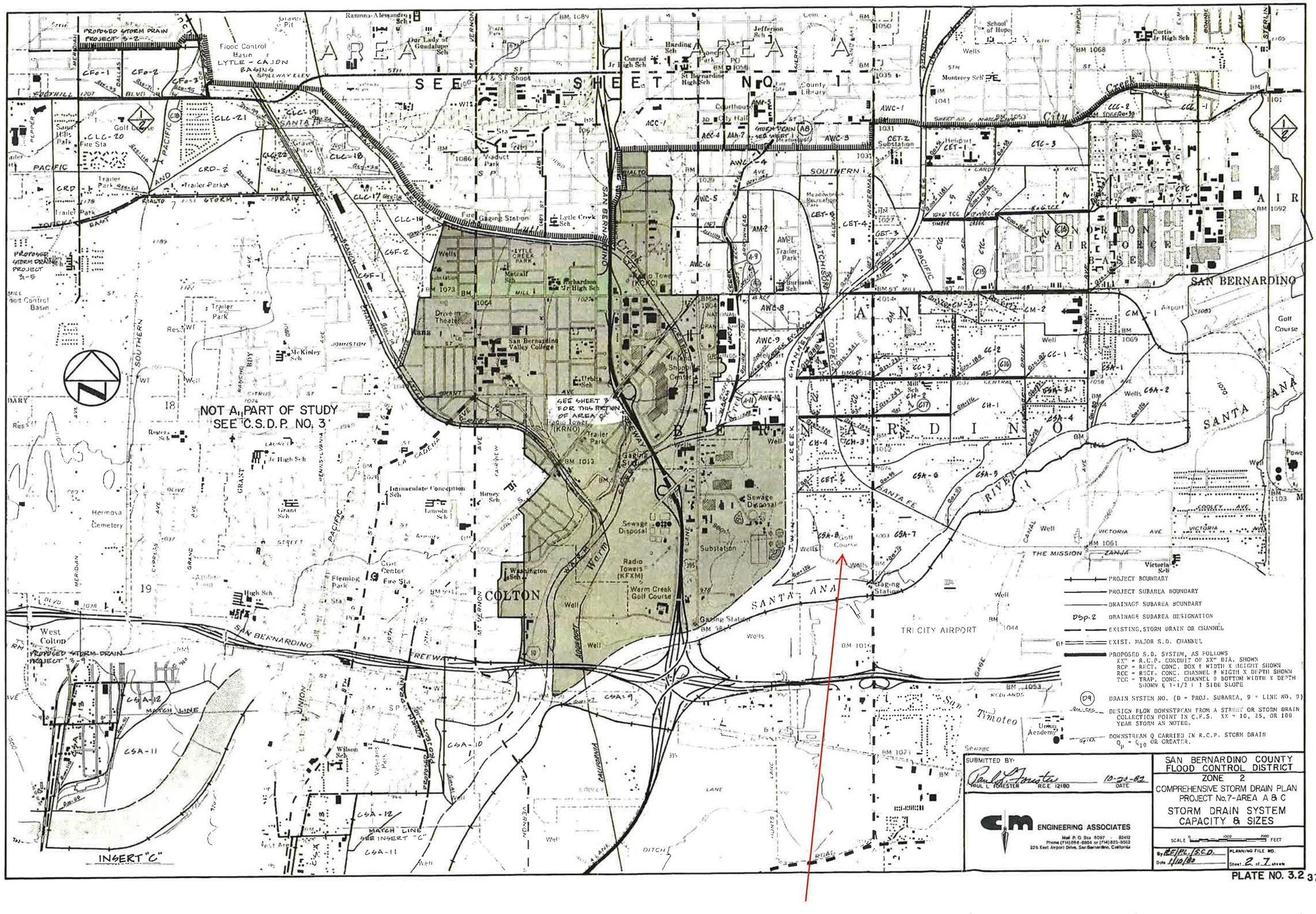


PLATE NO. 3.2 37

APPENDIX B

HYDROLOGY CALCULATIONS

EXISTING CONDITION

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
         (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
        (c) Copyright 1983-99 Advanced Engineering Software (aes)
            Ver. 8.0  Release Date: 01/01/99  License ID 1435

                        Analysis prepared by:

                          THIENES ENGINEERING
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                          LA MIRADA CA 90638
                    PH: (714) 521-4811 FAX: (714) 521-4173

 ************************* DESCRIPTION OF STUDY *************************
* GATEWAY SOUTH BUILDING 5                                              *
* 100-YEAR EXISTING CONDITION                                           *
* NODES 100-106                                                         *
 **************************************************************************

  FILE NAME: C:\XDRIVE\3412\3412EXA.DAT
  TIME/DATE OF STUDY: 12:44 12/18/2015
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  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) = 1.2500

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


**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   610.00
  ELEVATION DATA: UPSTREAM(FEET) =   1010.00  DOWNSTREAM(FEET) =   1005.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   31.785
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.830
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "GRASS"                    A        3.15      0.72       1.00    58   31.78
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.72
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.00
  SUBAREA RUNOFF(CFS) =      3.14
  TOTAL AREA(ACRES) =      3.15   PEAK FLOW RATE(CFS) =      3.14

**************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  52
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1005.00  DOWNSTREAM(FEET) =   1000.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   570.00   CHANNEL SLOPE =  0.0088
  CHANNEL FLOW THRU SUBAREA(CFS) =      3.14
  FLOW VELOCITY(FEET/SEC) =   1.78 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   5.35   Tc(MIN.) =  37.13
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =  1180.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN) =  37.13
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.667
```

```
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "GRASS"                     A        3.75      0.72       1.00    58
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.72
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.00
 SUBAREA AREA(ACRES) =     3.75      SUBAREA RUNOFF(CFS) =     3.18
 EFFECTIVE AREA(ACRES) =     6.90    AREA-AVERAGED Fm(INCH/HR) =  0.72
 AREA-AVERAGED Fp(INCH/HR) =  0.72   AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =     6.90        PEAK FLOW RATE(CFS) =       5.86

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   1000.00  DOWNSTREAM(FEET) =    997.60
 CHANNEL LENGTH THRU SUBAREA(FEET) =   346.00   CHANNEL SLOPE =  0.0069
 CHANNEL FLOW THRU SUBAREA(CFS) =      5.86
 FLOW VELOCITY(FEET/SEC) =   1.82 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   3.16   Tc(MIN.) =  40.29
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =  1526.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  40.29
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.587
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "GRASS"                     A        7.30      0.72       1.00    58
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.72
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.00
 SUBAREA AREA(ACRES) =     7.30      SUBAREA RUNOFF(CFS) =     5.67
 EFFECTIVE AREA(ACRES) =    14.20    AREA-AVERAGED Fm(INCH/HR) =  0.72
 AREA-AVERAGED Fp(INCH/HR) =  0.72   AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =    14.20        PEAK FLOW RATE(CFS) =      11.03

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    997.60  DOWNSTREAM(FEET) =    991.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   360.00   CHANNEL SLOPE =  0.0183
 CHANNEL FLOW THRU SUBAREA(CFS) =     11.03
 FLOW VELOCITY(FEET/SEC) =   3.47 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   1.73   Tc(MIN.) =  42.02
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =  1886.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  42.02
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.548
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "GRASS"                     A        4.00      0.72       1.00    58
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.72
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.00
 SUBAREA AREA(ACRES) =     4.00      SUBAREA RUNOFF(CFS) =     2.97
 EFFECTIVE AREA(ACRES) =    18.20    AREA-AVERAGED Fm(INCH/HR) =  0.72
 AREA-AVERAGED Fp(INCH/HR) =  0.72   AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =    18.20        PEAK FLOW RATE(CFS) =      13.49

****************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
```

```
>>>>>TRAVELTIME THRU SUBAREA<<<<<
================================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    991.00  DOWNSTREAM(FEET) =    988.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   404.00   CHANNEL SLOPE =  0.0074
 CHANNEL FLOW THRU SUBAREA(CFS) =     13.49
 FLOW VELOCITY(FEET/SEC) =   2.33 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   2.89   Tc(MIN.) =  44.92
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =  2290.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  44.92
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.487
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "GRASS"                     A        3.20      0.72       1.00    58
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.72
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.00
 SUBAREA AREA(ACRES) =    3.20      SUBAREA RUNOFF(CFS) =    2.20
 EFFECTIVE AREA(ACRES) =    21.40   AREA-AVERAGED Fm(INCH/HR) =  0.72
 AREA-AVERAGED Fp(INCH/HR) =  0.72  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =    21.40       PEAK FLOW RATE(CFS) =      14.70

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    988.00  DOWNSTREAM(FEET) =    983.70
 CHANNEL LENGTH THRU SUBAREA(FEET) =   470.00   CHANNEL SLOPE =  0.0091
 CHANNEL FLOW THRU SUBAREA(CFS) =     14.70
 FLOW VELOCITY(FEET/SEC) =   2.64 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   2.97   Tc(MIN.) =  47.89
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =  2760.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  47.89
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.431
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "GRASS"                     A        4.65      0.72       1.00    58
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.72
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.00
 SUBAREA AREA(ACRES) =    4.65      SUBAREA RUNOFF(CFS) =    2.96
 EFFECTIVE AREA(ACRES) =    26.05   AREA-AVERAGED Fm(INCH/HR) =  0.72
 AREA-AVERAGED Fp(INCH/HR) =  0.72  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =    26.05       PEAK FLOW RATE(CFS) =      16.58
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =     26.05  TC(MIN.) =     47.89
 EFFECTIVE AREA(ACRES) =     26.05  AREA-AVERAGED Fm(INCH/HR)=  0.72
 AREA-AVERAGED Fp(INCH/HR) =  0.72  AREA-AVERAGED Ap =  1.00
 PEAK FLOW RATE(CFS)    =     16.58
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
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                        Analysis prepared by:

                          THIENES ENGINEERING
                        16800 VALLEY VIEW AVENUE
                          LA MIRADA CA 90638
                    PH: (714) 521-4811 FAX: (714) 521-4173

 ************************** DESCRIPTION OF STUDY **************************
* GATEWAY SOUTH BUILDING 5                                                *
* 100-YEAR EXISTING CONDITION                                             *
* NODES 110-112                                                           *
 **************************************************************************

  FILE NAME: C:\XDRIVE\3412\3412EXB.DAT
  TIME/DATE OF STUDY: 13:20 12/18/2015
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  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) = 1.2500

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


**************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    111.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   900.00
  ELEVATION DATA: UPSTREAM(FEET) =   1007.00  DOWNSTREAM(FEET) =    990.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   31.613
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.836
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "GRASS"                    A        7.90      0.72       1.00     58   31.61
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.72
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.00
  SUBAREA RUNOFF(CFS) =      7.91
  TOTAL AREA(ACRES) =      7.90   PEAK FLOW RATE(CFS) =      7.91

**************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  52
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    990.50  DOWNSTREAM(FEET) =    984.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   515.00   CHANNEL SLOPE =  0.0126
  CHANNEL FLOW THRU SUBAREA(CFS) =      7.91
  FLOW VELOCITY(FEET/SEC) =   2.65 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   3.24   Tc(MIN.) =  34.85
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    112.00 =  1415.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN) =  34.85
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.732
```

```
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL GOOD COVER
  "GRASS"                     A        3.05      0.72       1.00    58
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.72
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.00
  SUBAREA AREA(ACRES) =     3.05      SUBAREA RUNOFF(CFS) =     2.77
  EFFECTIVE AREA(ACRES) =    10.95    AREA-AVERAGED Fm(INCH/HR) =  0.72
  AREA-AVERAGED Fp(INCH/HR) =  0.72   AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =    10.95        PEAK FLOW RATE(CFS) =       9.93
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =     10.95  TC(MIN.) =     34.85
  EFFECTIVE AREA(ACRES) =      10.95  AREA-AVERAGED Fm(INCH/HR)=  0.72
  AREA-AVERAGED Fp(INCH/HR) =  0.72   AREA-AVERAGED Ap =  1.00
  PEAK FLOW RATE(CFS)    =      9.93
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS

1
```

```
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                        Analysis prepared by:

                          THIENES ENGINEERING
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                          LA MIRADA CA 90638
                    PH: (714) 521-4811 FAX: (714) 521-4173

 ************************** DESCRIPTION OF STUDY **************************
* GATEWWAY SOUTH BUILDING 5                                               *
* 100-YEAR EXISTING CONDITION                                             *
* NODES 120-125                                                           *
 *************************************************************************

  FILE NAME: C:\XDRIVE\3412\3412EXC.DAT
  TIME/DATE OF STUDY: 13:23 12/18/2015
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  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) = 1.2500

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


**************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    121.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   600.00
  ELEVATION DATA: UPSTREAM(FEET) =   1010.50  DOWNSTREAM(FEET) =    999.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   26.783
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.028
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "GRASS"                     A        2.35      0.72       1.00    58   26.78
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.72
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.00
  SUBAREA RUNOFF(CFS) =      2.76
  TOTAL AREA(ACRES) =      2.35   PEAK FLOW RATE(CFS) =      2.76

**************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  52
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    999.30  DOWNSTREAM(FEET) =    997.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   385.00   CHANNEL SLOPE =  0.0047
  CHANNEL FLOW THRU SUBAREA(CFS) =      2.76
  FLOW VELOCITY(FEET/SEC) =   1.26 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   5.09   Tc(MIN.) =  31.87
  LONGEST FLOWPATH FROM NODE    120.00 TO NODE    122.00 =   985.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN) =  31.87
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.827
```

```
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "GRASS"                     A        3.00      0.72       1.00    58
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.72
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.00
 SUBAREA AREA(ACRES) =     3.00      SUBAREA RUNOFF(CFS) =     2.98
 EFFECTIVE AREA(ACRES) =     5.35    AREA-AVERAGED Fm(INCH/HR) =  0.72
 AREA-AVERAGED Fp(INCH/HR) =  0.72   AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =     5.35        PEAK FLOW RATE(CFS) =        5.31

****************************************************************************
 FLOW PROCESS FROM NODE    122.00 TO NODE    123.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    997.50  DOWNSTREAM(FEET) =    996.30
 CHANNEL LENGTH THRU SUBAREA(FEET) =   268.00   CHANNEL SLOPE =  0.0045
 CHANNEL FLOW THRU SUBAREA(CFS) =      5.31
 FLOW VELOCITY(FEET/SEC) =   1.43 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   3.12   Tc(MIN.) =  34.99
 LONGEST FLOWPATH FROM NODE    120.00 TO NODE    123.00 =  1253.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    122.00 TO NODE    123.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  34.99
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.727
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "GRASS"                     A        3.20      0.72       1.00    58
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.72
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.00
 SUBAREA AREA(ACRES) =     3.20      SUBAREA RUNOFF(CFS) =     2.89
 EFFECTIVE AREA(ACRES) =     8.55    AREA-AVERAGED Fm(INCH/HR) =  0.72
 AREA-AVERAGED Fp(INCH/HR) =  0.72   AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =     8.55        PEAK FLOW RATE(CFS) =        7.72

****************************************************************************
 FLOW PROCESS FROM NODE    123.00 TO NODE    124.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    996.30  DOWNSTREAM(FEET) =    992.70
 CHANNEL LENGTH THRU SUBAREA(FEET) =   477.00   CHANNEL SLOPE =  0.0075
 CHANNEL FLOW THRU SUBAREA(CFS) =      7.72
 FLOW VELOCITY(FEET/SEC) =   2.04 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   3.91   Tc(MIN.) =  38.90
 LONGEST FLOWPATH FROM NODE    120.00 TO NODE    124.00 =  1730.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    123.00 TO NODE    124.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  38.90
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.621
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "GRASS"                     A        4.80      0.72       1.00    58
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.72
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.00
 SUBAREA AREA(ACRES) =     4.80      SUBAREA RUNOFF(CFS) =     3.88
 EFFECTIVE AREA(ACRES) =    13.35    AREA-AVERAGED Fm(INCH/HR) =  0.72
 AREA-AVERAGED Fp(INCH/HR) =  0.72   AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =    13.35        PEAK FLOW RATE(CFS) =       10.78

****************************************************************************
 FLOW PROCESS FROM NODE    124.00 TO NODE    125.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
```

```
>>>>>TRAVELTIME THRU SUBAREA<<<<<
------------------------------------------------------------------------
 ELEVATION DATA: UPSTREAM(FEET) =     992.70  DOWNSTREAM(FEET) =     988.50
 CHANNEL LENGTH THRU SUBAREA(FEET) =   712.00   CHANNEL SLOPE =  0.0059
 CHANNEL FLOW THRU SUBAREA(CFS) =      10.78
 FLOW VELOCITY(FEET/SEC) =    1.96 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   6.07   Tc(MIN.) =  44.96
 LONGEST FLOWPATH FROM NODE    120.00 TO NODE    125.00 =  2442.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    124.00 TO NODE    125.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  44.96
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.486
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "GRASS"                     A        2.60      0.72       1.00    58
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.72
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.00
 SUBAREA AREA(ACRES) =     2.60      SUBAREA RUNOFF(CFS) =     1.78
 EFFECTIVE AREA(ACRES) =    15.95    AREA-AVERAGED Fm(INCH/HR) =  0.72
 AREA-AVERAGED Fp(INCH/HR) =  0.72   AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =    15.95        PEAK FLOW RATE(CFS) =      10.94
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =     15.95  TC(MIN.) =     44.96
 EFFECTIVE AREA(ACRES) =      15.95  AREA-AVERAGED Fm(INCH/HR)=  0.72
 AREA-AVERAGED Fp(INCH/HR) =  0.72   AREA-AVERAGED Ap =  1.00
 PEAK FLOW RATE(CFS)    =     10.94
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS

1
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**************************************************************************
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                        Analysis prepared by:

                          THIENES ENGINEERING
                        16800 VALLEY VIEW AVENUE
                          LA MIRADA CA 90638
                   PH: (714) 521-4811 FAX: (714) 521-4173

 ************************* DESCRIPTION OF STUDY *************************
* GATEWAY SOUTH BUILDING 5                                              *
* 100-YEAR EXISTING CONDITION                                           *
* NODES 200-205                                                         *
 ************************************************************************

  FILE NAME: C:\XDRIVE\3412\3412EXD.DAT
  TIME/DATE OF STUDY: 11:30 03/22/2017
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  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) = 1.2500

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


**************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   564.00
  ELEVATION DATA: UPSTREAM(FEET) =   1010.70  DOWNSTREAM(FEET) =   1006.68

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.299
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.599
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  A        0.40      0.80       0.10    52   10.30
  NATURAL GOOD COVER
  "GRASS"                     A        0.40      0.72       1.00    58   31.68
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.73
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.55
  SUBAREA RUNOFF(CFS) =      2.30
  TOTAL AREA(ACRES) =      0.80   PEAK FLOW RATE(CFS) =      2.30

**************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  61
--------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
==========================================================================
  UPSTREAM ELEVATION(FEET) = 1006.68  DOWNSTREAM ELEVATION(FEET) =  999.69
  STREET LENGTH(FEET) =   760.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  15.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0148
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.53
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.36
    HALFSTREET FLOOD WIDTH(FEET) =   11.71
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.37
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.85
  STREET FLOW TRAVEL TIME(MIN.) =   5.34   Tc(MIN.) =  15.64
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.801
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  A        0.50      0.80       0.10    52
  NATURAL GOOD COVER
  "GRASS"                     A        0.65      0.72       1.00    58
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.73
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.61
  SUBAREA AREA(ACRES) =    1.15      SUBAREA RUNOFF(CFS) =    2.44
  EFFECTIVE AREA(ACRES) =    1.95    AREA-AVERAGED Fm(INCH/HR) =  0.43
  AREA-AVERAGED Fp(INCH/HR) =  0.73  AREA-AVERAGED Ap =  0.58
```

```
 TOTAL AREA(ACRES) =    1.95        PEAK FLOW RATE(CFS) =       4.17

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.38   HALFSTREET FLOOD WIDTH(FEET) =  12.53
 FLOW VELOCITY(FEET/SEC.) =  2.47   DEPTH*VELOCITY(FT*FT/SEC.) =   0.93
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =  1324.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  15.64
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.801
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "GRASS"                     A        0.15      0.72       1.00    58
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.72
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.00
 SUBAREA AREA(ACRES) =     0.15      SUBAREA RUNOFF(CFS) =     0.28
 EFFECTIVE AREA(ACRES) =     2.10    AREA-AVERAGED Fm(INCH/HR) =  0.45
 AREA-AVERAGED Fp(INCH/HR) =  0.73  AREA-AVERAGED Ap =  0.61
 TOTAL AREA(ACRES) =     2.10        PEAK FLOW RATE(CFS) =       4.45

****************************************************************************
 FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  61
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  999.69  DOWNSTREAM ELEVATION(FEET) =  998.16
 STREET LENGTH(FEET) =   252.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 20.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  15.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL) =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0148
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.68
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.46
   HALFSTREET FLOOD WIDTH(FEET) =   16.46
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.36
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.08
 STREET FLOW TRAVEL TIME(MIN.) =   1.78   Tc(MIN.) =  17.42
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.625
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  A        1.95      0.80       0.10    52
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
 SUBAREA AREA(ACRES) =     1.95      SUBAREA RUNOFF(CFS) =     4.47
 EFFECTIVE AREA(ACRES) =     4.05    AREA-AVERAGED Fm(INCH/HR) =  0.27
 AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.37
 TOTAL AREA(ACRES) =     4.05        PEAK FLOW RATE(CFS) =       8.58

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.49   HALFSTREET FLOOD WIDTH(FEET) =  18.15
 FLOW VELOCITY(FEET/SEC.) =  2.51   DEPTH*VELOCITY(FT*FT/SEC.) =   1.23
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    203.00 =  1576.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  17.42
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.625
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "GRASS"                     A        0.65      0.72       1.00    58
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.72
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.00
 SUBAREA AREA(ACRES) =     0.65      SUBAREA RUNOFF(CFS) =     1.11
 EFFECTIVE AREA(ACRES) =     4.70    AREA-AVERAGED Fm(INCH/HR) =  0.33
 AREA-AVERAGED Fp(INCH/HR) =  0.73  AREA-AVERAGED Ap =  0.45
 TOTAL AREA(ACRES) =     4.70        PEAK FLOW RATE(CFS) =       9.70

****************************************************************************
 FLOW PROCESS FROM NODE    203.00 TO NODE    204.00 IS CODE =   9
----------------------------------------------------------------------------
 >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
 UPSTREAM NODE ELEVATION(FEET) =    998.16
 DOWNSTREAM NODE ELEVATION(FEET) =    997.70
 CHANNEL LENGTH THRU SUBAREA(FEET) =    50.00
 "V" GUTTER WIDTH(FEET) =   3.00   GUTTER HIKE(FEET) =  0.170
 PAVEMENT LIP(FEET) =  0.013   MANNING'S N = .0150
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
```

```
 MAXIMUM DEPTH(FEET) =    0.50
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.600
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  A        1.30      0.80       0.10    52
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     11.17
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.89
 AVERAGE FLOW DEPTH(FEET) =   0.42   FLOOD WIDTH(FEET) =   26.87
 "V" GUTTER FLOW TRAVEL TIME(MIN.) =   0.29   Tc(MIN.) =  17.71
 SUBAREA AREA(ACRES) =    1.30       SUBAREA RUNOFF(CFS) =    2.95
 EFFECTIVE AREA(ACRES) =    6.00     AREA-AVERAGED Fm(INCH/HR) =   0.28
 AREA-AVERAGED Fp(INCH/HR) =   0.74  AREA-AVERAGED Ap =   0.38
 TOTAL AREA(ACRES) =    6.00         PEAK FLOW RATE(CFS) =      12.54

 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) =  0.43   FLOOD WIDTH(FEET) =   28.24
 FLOW VELOCITY(FEET/SEC.) =   2.96   DEPTH*VELOCITY(FT*FT/SEC) =   1.29
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    204.00 =  1626.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    204.00 TO NODE    205.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    997.70  DOWNSTREAM(FEET) =    995.30
 CHANNEL LENGTH THRU SUBAREA(FEET) =   344.00   CHANNEL SLOPE =  0.0070
 CHANNEL FLOW THRU SUBAREA(CFS) =     12.54
 FLOW VELOCITY(FEET/SEC) =   2.21 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   2.59   Tc(MIN.) =  20.30
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    205.00 =  1970.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    204.00 TO NODE    205.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  20.30
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.395
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "GRASS"                     A        4.20      0.72       1.00    58
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.72
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.00
 SUBAREA AREA(ACRES) =    4.20       SUBAREA RUNOFF(CFS) =    6.32
 EFFECTIVE AREA(ACRES) =   10.20     AREA-AVERAGED Fm(INCH/HR) =  0.46
 AREA-AVERAGED Fp(INCH/HR) =  0.73   AREA-AVERAGED Ap =  0.63
 TOTAL AREA(ACRES) =    10.20        PEAK FLOW RATE(CFS) =      17.75
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =     10.20  TC(MIN.) =     20.30
 EFFECTIVE AREA(ACRES) =     10.20  AREA-AVERAGED Fm(INCH/HR)=  0.46
 AREA-AVERAGED Fp(INCH/HR) =  0.73  AREA-AVERAGED Ap =  0.63
 PEAK FLOW RATE(CFS)    =     17.75
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS

1
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**************************************************************************
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                        Analysis prepared by:

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                        16800 VALLEY VIEW AVENUE
                          LA MIRADA CA 90638
                   PH: (714) 521-4811 FAX: (714) 521-4173

 ************************* DESCRIPTION OF STUDY *************************
* GATEWAY SOUTH BUILDING 5                                              *
* 100-YEAR EXISTING CONDITION                                           *
* NODES 300-302                                                         *
 ************************************************************************

  FILE NAME: C:\XDRIVE\3412\3412EXE.DAT
  TIME/DATE OF STUDY: 10:43 02/12/2017
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  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) = 1.2500

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


**************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   750.00
  ELEVATION DATA: UPSTREAM(FEET) =   1011.00  DOWNSTREAM(FEET) =   1006.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   37.081
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.668
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "GRASS"                     A        5.10      0.72       1.00    58   37.08
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.72
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.00
  SUBAREA RUNOFF(CFS) =       4.33
  TOTAL AREA(ACRES) =      5.10   PEAK FLOW RATE(CFS) =      4.33

**************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  52
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1006.70  DOWNSTREAM(FEET) =   1001.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   290.00   CHANNEL SLOPE =  0.0179
  CHANNEL FLOW THRU SUBAREA(CFS) =      4.33
  FLOW VELOCITY(FEET/SEC) =   2.73 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.77   Tc(MIN.) =  38.85
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =  1040.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN) =  38.85
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.622
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL GOOD COVER
  "GRASS"                     A        3.60      0.72       1.00    58
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.72
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.00
  SUBAREA AREA(ACRES) =     3.60     SUBAREA RUNOFF(CFS) =     2.91
  EFFECTIVE AREA(ACRES) =     8.70   AREA-AVERAGED Fm(INCH/HR) =  0.72
  AREA-AVERAGED Fp(INCH/HR) =  0.72  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =     8.70       PEAK FLOW RATE(CFS) =       7.03
==========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =      8.70  TC(MIN.) =     38.85
  EFFECTIVE AREA(ACRES) =       8.70  AREA-AVERAGED Fm(INCH/HR)=  0.72
  AREA-AVERAGED Fp(INCH/HR) =  0.72  AREA-AVERAGED Ap =  1.00
  PEAK FLOW RATE(CFS)    =      7.03
==========================================================================
==========================================================================
```

```
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                          Analysis prepared by:

                            THIENES ENGINEERING
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                            LA MIRADA CA 90638
                     PH: (714) 521-4811 FAX: (714) 521-4173

 ************************** DESCRIPTION OF STUDY **************************
* GATEWAY SOUTH BUILDING 5                                                *
* 100-YEAR EXISTING CONDITION                                             *
* NODES 310-314                                                           *
 **************************************************************************

  FILE NAME: C:\XDRIVE\3412\3412EXF.DAT
  TIME/DATE OF STUDY: 11:31 03/22/2017
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  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) = 1.2500

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


**************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    311.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   750.00
  ELEVATION DATA: UPSTREAM(FEET) =   1012.00  DOWNSTREAM(FEET) =   1007.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   18.432
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.538
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "1 DWELLING/ACRE"           A        6.50      0.80       0.80     52   18.43
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.80
  SUBAREA RUNOFF(CFS) =     11.12
  TOTAL AREA(ACRES) =      6.50   PEAK FLOW RATE(CFS) =     11.12

**************************************************************************
  FLOW PROCESS FROM NODE    311.00 TO NODE    312.00 IS CODE =  52
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1007.50  DOWNSTREAM(FEET) =   1005.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   458.00   CHANNEL SLOPE =  0.0055
  CHANNEL FLOW THRU SUBAREA(CFS) =     11.12
  FLOW VELOCITY(FEET/SEC) =   1.90 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   4.02   Tc(MIN.) =  22.46
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    312.00 =  1208.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE    311.00 TO NODE    312.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN) =  22.46
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.254
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "1 DWELLING/ACRE"           A        4.90      0.80       0.80     52
  NATURAL GOOD COVER
  "GRASS"                     A        1.50      0.72       1.00     58
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.78
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.85
  SUBAREA AREA(ACRES) =     6.40      SUBAREA RUNOFF(CFS) =     9.20
  EFFECTIVE AREA(ACRES) =    12.90    AREA-AVERAGED Fm(INCH/HR) =  0.65
  AREA-AVERAGED Fp(INCH/HR) =  0.79  AREA-AVERAGED Ap =  0.82
  TOTAL AREA(ACRES) =    12.90       PEAK FLOW RATE(CFS) =      18.66

**************************************************************************
  FLOW PROCESS FROM NODE    312.00 TO NODE    313.00 IS CODE =  52
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
```

```
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1005.00  DOWNSTREAM(FEET) =   1002.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   230.00   CHANNEL SLOPE =  0.0130
  CHANNEL FLOW THRU SUBAREA(CFS) =     18.66
  FLOW VELOCITY(FEET/SEC) =   3.36 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.14   Tc(MIN.) =  23.60
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    313.00 =  1438.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    312.00 TO NODE    313.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN) =  23.60
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.188
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "1 DWELLING/ACRE"           A        2.45      0.80       0.80    52
  NATURAL GOOD COVER
  "GRASS"                     A        0.90      0.72       1.00    58
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.77
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.85
  SUBAREA AREA(ACRES) =     3.35      SUBAREA RUNOFF(CFS) =     4.61
  EFFECTIVE AREA(ACRES) =    16.25   AREA-AVERAGED Fm(INCH/HR) =  0.65
  AREA-AVERAGED Fp(INCH/HR) =  0.78  AREA-AVERAGED Ap =  0.83
  TOTAL AREA(ACRES) =    16.25       PEAK FLOW RATE(CFS) =      22.50

****************************************************************************
  FLOW PROCESS FROM NODE    313.00 TO NODE    314.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1002.00  DOWNSTREAM(FEET) =    997.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   440.00   CHANNEL SLOPE =  0.0102
  CHANNEL FLOW THRU SUBAREA(CFS) =     22.50
  FLOW VELOCITY(FEET/SEC) =   3.13 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.34   Tc(MIN.) =  25.94
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    314.00 =  1878.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    313.00 TO NODE    314.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN) =  25.94
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.067
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  A        0.80      0.80       0.10    52
  RESIDENTIAL
  "1 DWELLING/ACRE"           A        5.90      0.80       0.80    52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.72
  SUBAREA AREA(ACRES) =     6.70      SUBAREA RUNOFF(CFS) =     9.03
  EFFECTIVE AREA(ACRES) =    22.95   AREA-AVERAGED Fm(INCH/HR) =  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.79  AREA-AVERAGED Ap =  0.80
  TOTAL AREA(ACRES) =    22.95       PEAK FLOW RATE(CFS) =      29.76
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =     22.95  TC(MIN.) =     25.94
  EFFECTIVE AREA(ACRES) =     22.95  AREA-AVERAGED Fm(INCH/HR)=  0.63
  AREA-AVERAGED Fp(INCH/HR) =  0.79  AREA-AVERAGED Ap =  0.80
  PEAK FLOW RATE(CFS)    =     29.76
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS

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```

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**************************************************************************
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                          Analysis prepared by:

                            THIENES ENGINEERING
                          16800 VALLEY VIEW AVENUE
                             LA MIRADA CA 90638
                     PH: (714) 521-4811 FAX: (714) 521-4173

 ************************** DESCRIPTION OF STUDY **************************
* TEI JOB NO 3412                                                        *
* OFFSITE AREA NORTH OF DUMAS                                            *
* 100 YEAR STORM EVENT                                                   *
 ************************************************************************

  FILE NAME: C:\XDRIVE\3412\400.DAT
  TIME/DATE OF STUDY: 10:13 03/21/2017
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  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) = 1.2500

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


**************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   643.00
  ELEVATION DATA: UPSTREAM(FEET) =   1010.30  DOWNSTREAM(FEET) =   1004.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.284
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.602
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  A        1.95      0.80       0.10    52   10.28
  RESIDENTIAL
  "1 DWELLING/ACRE"           A        2.00      0.80       0.80    52   15.87
  NATURAL POOR COVER
  "CHAPARRAL,BROADLEAF"       A        1.95      0.50       1.00    73   17.76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.64
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.63
  SUBAREA RUNOFF(CFS) =     16.96
  TOTAL AREA(ACRES) =      5.90   PEAK FLOW RATE(CFS) =     16.96

**************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  52
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1004.30  DOWNSTREAM(FEET) =   1002.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   655.00   CHANNEL SLOPE =  0.0035
  CHANNEL FLOW THRU SUBAREA(CFS) =     16.96
  FLOW VELOCITY(FEET/SEC) =   1.70 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   6.43   Tc(MIN.) =  16.71
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    402.00 =  1298.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    402.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN) =  16.71
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.692
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "2 DWELLINGS/ACRE"          A        2.75      0.80       0.70    52
  NATURAL POOR COVER
  "CHAPARRAL,BROADLEAF"       A        1.85      0.50       1.00    73
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.65
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.82
  SUBAREA AREA(ACRES) =     4.60     SUBAREA RUNOFF(CFS) =     8.93
  EFFECTIVE AREA(ACRES) =    10.50   AREA-AVERAGED Fm(INCH/HR) =  0.46
  AREA-AVERAGED Fp(INCH/HR) =  0.65  AREA-AVERAGED Ap =  0.72
  TOTAL AREA(ACRES) =    10.50      PEAK FLOW RATE(CFS) =      21.05

**************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    413.00 IS CODE =  52
```

```
------------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
==============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   1002.00  DOWNSTREAM(FEET) =    100.30
 CHANNEL LENGTH THRU SUBAREA(FEET) =   280.00   CHANNEL SLOPE =  3.2204
 NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
 CHANNEL FLOW THRU SUBAREA(CFS) =     21.05
 FLOW VELOCITY(FEET/SEC) =   9.61 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   0.49   Tc(MIN.) =  17.20
 LONGEST FLOWPATH FROM NODE    400.00 TO NODE    413.00 =  1578.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    413.00 TO NODE    413.00 IS CODE =  81
------------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
 MAINLINE Tc(MIN) =  17.20
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.646
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL POOR COVER
 "CHAPARRAL,BROADLEAF"       A        3.55      0.50       1.00    73
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.50
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.00
 SUBAREA AREA(ACRES) =    3.55      SUBAREA RUNOFF(CFS) =    6.85
 EFFECTIVE AREA(ACRES) =    14.05   AREA-AVERAGED Fm(INCH/HR) =  0.47
 AREA-AVERAGED Fp(INCH/HR) =  0.60  AREA-AVERAGED Ap =  0.79
 TOTAL AREA(ACRES) =    14.05       PEAK FLOW RATE(CFS) =      27.47

****************************************************************************
 FLOW PROCESS FROM NODE    413.00 TO NODE    413.00 IS CODE =   1
------------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =  17.20
 RAINFALL INTENSITY(INCH/HR) =   2.65
 AREA-AVERAGED Fm(INCH/HR) =  0.47
 AREA-AVERAGED Fp(INCH/HR) =  0.60
 AREA-AVERAGED Ap =  0.79
 EFFECTIVE STREAM AREA(ACRES) =   14.05
 TOTAL STREAM AREA(ACRES) =   14.05
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     27.47

****************************************************************************
 FLOW PROCESS FROM NODE    410.00 TO NODE    411.00 IS CODE =  21
------------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   412.00
 ELEVATION DATA: UPSTREAM(FEET) =   1008.50  DOWNSTREAM(FEET) =   1005.70

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.170
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.858
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                  A        1.35      0.80       0.10    52    9.17
 NATURAL POOR COVER
 "CHAPARRAL,BROADLEAF"       A        2.80      0.50       1.00    73   15.84
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.52
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.71
 SUBAREA RUNOFF(CFS) =     13.05
 TOTAL AREA(ACRES) =      4.15   PEAK FLOW RATE(CFS) =     13.05

****************************************************************************
 FLOW PROCESS FROM NODE    411.00 TO NODE    412.00 IS CODE =  52
------------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
==============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   1005.70  DOWNSTREAM(FEET) =   1002.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   530.00   CHANNEL SLOPE =  0.0070
 CHANNEL FLOW THRU SUBAREA(CFS) =     13.05
 FLOW VELOCITY(FEET/SEC) =   2.24 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   3.95   Tc(MIN.) =  13.12
 LONGEST FLOWPATH FROM NODE    410.00 TO NODE    412.00 =   942.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    412.00 TO NODE    412.00 IS CODE =  81
------------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
 MAINLINE Tc(MIN) =  13.12
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.112
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "2 DWELLINGS/ACRE"          A        2.00      0.80       0.70    52
 NATURAL POOR COVER
 "CHAPARRAL,BROADLEAF"       A        2.65      0.50       1.00    73
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.87
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 SUBAREA AREA(ACRES) =     4.65      SUBAREA RUNOFF(CFS) =    10.82
 EFFECTIVE AREA(ACRES) =     8.80    AREA-AVERAGED Fm(INCH/HR) =  0.45
 AREA-AVERAGED Fp(INCH/HR) =  0.57   AREA-AVERAGED Ap =  0.79
 TOTAL AREA(ACRES) =     8.80        PEAK FLOW RATE(CFS) =      21.08

****************************************************************************
 FLOW PROCESS FROM NODE    412.00 TO NODE    413.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   1002.00  DOWNSTREAM(FEET) =   1000.30
 CHANNEL LENGTH THRU SUBAREA(FEET) =   635.00   CHANNEL SLOPE =  0.0027
 CHANNEL FLOW THRU SUBAREA(CFS) =     21.08
 FLOW VELOCITY(FEET/SEC) =   1.57 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   6.73   Tc(MIN.) =  19.85
 LONGEST FLOWPATH FROM NODE    410.00 TO NODE    413.00 =  1577.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    413.00 TO NODE    413.00 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.) =  19.85
 RAINFALL INTENSITY(INCH/HR) =   2.43
 AREA-AVERAGED Fm(INCH/HR) =  0.45
 AREA-AVERAGED Fp(INCH/HR) =  0.57
 AREA-AVERAGED Ap =  0.79
 EFFECTIVE STREAM AREA(ACRES) =    8.80
 TOTAL STREAM AREA(ACRES) =    8.80
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     21.08

 ** CONFLUENCE DATA **
  STREAM     Q     Tc   Intensity   Fp(Fm)      Ap   Ae      HEADWATER
  NUMBER   (CFS) (MIN.) (INCH/HR) (INCH/HR)        (ACRES)    NODE
     1     27.47  17.20    2.646  0.60( 0.47) 0.79    14.1     400.00
     2     21.08  19.85    2.427  0.57( 0.45) 0.79     8.8     410.00

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

 ** PEAK FLOW RATE TABLE **
  STREAM     Q     Tc   Intensity   Fp(Fm)      Ap   Ae      HEADWATER
  NUMBER   (CFS) (MIN.) (INCH/HR) (INCH/HR)        (ACRES)    NODE
     1     47.75  17.20    2.646  0.59( 0.47) 0.79    21.7     400.00
     2     45.79  19.85    2.427  0.59( 0.46) 0.79    22.9     410.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =     47.75    Tc(MIN.) =    17.20
 EFFECTIVE AREA(ACRES) =    21.67   AREA-AVERAGED Fm(INCH/HR) =  0.47
 AREA-AVERAGED Fp(INCH/HR) =  0.59  AREA-AVERAGED Ap =  0.79
 TOTAL AREA(ACRES) =     22.85
 LONGEST FLOWPATH FROM NODE    400.00 TO NODE    413.00 =  1578.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =     22.85  TC(MIN.) =     17.20
 EFFECTIVE AREA(ACRES) =     21.67  AREA-AVERAGED Fm(INCH/HR)=  0.47
 AREA-AVERAGED Fp(INCH/HR) =  0.59  AREA-AVERAGED Ap =  0.79
 PEAK FLOW RATE(CFS)   =     47.75

 ** 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  17.20    2.646  0.59( 0.47) 0.79    21.7     400.00
     2     45.79  19.85    2.427  0.59( 0.46) 0.79    22.9     410.00
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS

1
```

PROPOSED CONDITION

```
**************************************************************************
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 ************************** DESCRIPTION OF STUDY **************************
* GATEWAY SOUTH BUILDING 5                                                *
* PROPOSED CONDITION                                                      *
* 100-YEAR                                                                *
 **************************************************************************

  FILE NAME: C:\XDRIVE\3412\3412A.DAT
  TIME/DATE OF STUDY: 13:32 03/22/2017
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  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) = 1.2500

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


**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   466.00
  ELEVATION DATA: UPSTREAM(FEET) =   1011.24  DOWNSTREAM(FEET) =   1001.07

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.629
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.309
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  A        3.50      0.80        0.10    52    7.63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
  SUBAREA RUNOFF(CFS) =     13.32
  TOTAL AREA(ACRES) =      3.50   PEAK FLOW RATE(CFS) =     13.32

**************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =   9
--------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
--------------------------------------------------------------------------
  UPSTREAM NODE ELEVATION(FEET) =   1001.07
  DOWNSTREAM NODE ELEVATION(FEET) =   1000.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   210.00
  "V" GUTTER WIDTH(FEET) =   3.00   GUTTER HIKE(FEET) =  0.170
  PAVEMENT LIP(FEET) =  0.013   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   0.67
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.899
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  A        3.10      0.80        0.10    52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     18.66
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.53
  AVERAGE FLOW DEPTH(FEET) =   0.53   FLOOD WIDTH(FEET) =   37.75
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.38   Tc(MIN.) =   9.01
  SUBAREA AREA(ACRES) =    3.10       SUBAREA RUNOFF(CFS) =   10.66
  EFFECTIVE AREA(ACRES) =    6.60     AREA-AVERAGED Fm(INCH/HR) =   0.08
  AREA-AVERAGED Fp(INCH/HR) =   0.80  AREA-AVERAGED Ap =   0.10
  TOTAL AREA(ACRES) =    6.60         PEAK FLOW RATE(CFS) =      22.69

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.56   FLOOD WIDTH(FEET) =   40.80
  FLOW VELOCITY(FEET/SEC.) =   2.65   DEPTH*VELOCITY(FT*FT/SEC) =   1.48
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =   676.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =   9
--------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
==========================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1000.00
  DOWNSTREAM NODE ELEVATION(FEET) =    999.00
```

```
 CHANNEL LENGTH THRU SUBAREA(FEET) =   200.00
 "V" GUTTER WIDTH(FEET) =   3.00   GUTTER HIKE(FEET) =  0.170
 PAVEMENT LIP(FEET) =  0.013   MANNING'S N = .0150
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
 MAXIMUM DEPTH(FEET) =   0.67
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.614
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 A        3.20      0.80        0.10    52
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     27.77
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.75
 AVERAGE FLOW DEPTH(FEET) =   0.60   FLOOD WIDTH(FEET) =   44.42
 "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.21   Tc(MIN.) =  10.23
 SUBAREA AREA(ACRES) =    3.20       SUBAREA RUNOFF(CFS) =   10.18
 EFFECTIVE AREA(ACRES) =    9.80     AREA-AVERAGED Fm(INCH/HR) =   0.08
 AREA-AVERAGED Fp(INCH/HR) =   0.80  AREA-AVERAGED Ap =   0.10
 TOTAL AREA(ACRES) =    9.80         PEAK FLOW RATE(CFS) =      31.17

 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) =  0.62   FLOOD WIDTH(FEET) =   46.51
 FLOW VELOCITY(FEET/SEC.) =   2.82   DEPTH*VELOCITY(FT*FT/SEC) =   1.74
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =   876.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =   9
----------------------------------------------------------------------------
 >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
 UPSTREAM NODE ELEVATION(FEET) =    999.00
 DOWNSTREAM NODE ELEVATION(FEET) =    997.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   400.00
 "V" GUTTER WIDTH(FEET) =   3.00   GUTTER HIKE(FEET) =  0.170
 PAVEMENT LIP(FEET) =  0.013   MANNING'S N = .0150
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
 MAXIMUM DEPTH(FEET) =   0.75
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.208
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 A        5.50      0.80        0.10    52
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     38.90
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.97
 AVERAGE FLOW DEPTH(FEET) =   0.66   FLOOD WIDTH(FEET) =   50.72
 "V" GUTTER FLOW TRAVEL TIME(MIN.) =   2.25   Tc(MIN.) =  12.47
 SUBAREA AREA(ACRES) =    5.50       SUBAREA RUNOFF(CFS) =   15.49
 EFFECTIVE AREA(ACRES) =   15.30     AREA-AVERAGED Fm(INCH/HR) =   0.08
 AREA-AVERAGED Fp(INCH/HR) =   0.80  AREA-AVERAGED Ap =   0.10
 TOTAL AREA(ACRES) =   15.30         PEAK FLOW RATE(CFS) =      43.08

 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) =  0.68   FLOOD WIDTH(FEET) =   52.82
 FLOW VELOCITY(FEET/SEC.) =   3.03   DEPTH*VELOCITY(FT*FT/SEC) =   2.07
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =  1276.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =   9
----------------------------------------------------------------------------
 >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
 UPSTREAM NODE ELEVATION(FEET) =    997.00
 DOWNSTREAM NODE ELEVATION(FEET) =    995.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   400.00
 "V" GUTTER WIDTH(FEET) =   3.00   GUTTER HIKE(FEET) =  0.170
 PAVEMENT LIP(FEET) =  0.013   MANNING'S N = .0150
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
 MAXIMUM DEPTH(FEET) =   0.75
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.921
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 A        5.50      0.80        0.10    52
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     50.11
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.15
 AVERAGE FLOW DEPTH(FEET) =   0.71   FLOOD WIDTH(FEET) =   55.93
 "V" GUTTER FLOW TRAVEL TIME(MIN.) =   2.11   Tc(MIN.) =  14.58
 SUBAREA AREA(ACRES) =    5.50       SUBAREA RUNOFF(CFS) =   14.06
 EFFECTIVE AREA(ACRES) =   20.80     AREA-AVERAGED Fm(INCH/HR) =   0.08
 AREA-AVERAGED Fp(INCH/HR) =   0.80  AREA-AVERAGED Ap =   0.10
 TOTAL AREA(ACRES) =   20.80         PEAK FLOW RATE(CFS) =      53.18

 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) =  0.73   FLOOD WIDTH(FEET) =   57.26
 FLOW VELOCITY(FEET/SEC.) =   3.20   DEPTH*VELOCITY(FT*FT/SEC) =   2.32
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =  1676.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =   9
----------------------------------------------------------------------------
 >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
 UPSTREAM NODE ELEVATION(FEET) =    995.00
 DOWNSTREAM NODE ELEVATION(FEET) =    993.30
```

```
 CHANNEL LENGTH THRU SUBAREA(FEET) =   329.00
 "V" GUTTER WIDTH(FEET) =   3.00   GUTTER HIKE(FEET) =  0.170
 PAVEMENT LIP(FEET) =  0.013   MANNING'S N = .0150
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
 MAXIMUM DEPTH(FEET) =   0.83
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.738
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  A        4.45      0.80       0.10    52
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     58.51
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.30
 AVERAGE FLOW DEPTH(FEET) =   0.74   FLOOD WIDTH(FEET) =   59.09
 "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.66   Tc(MIN.) =  16.24
 SUBAREA AREA(ACRES) =    4.45       SUBAREA RUNOFF(CFS) =   10.65
 EFFECTIVE AREA(ACRES) =   25.25     AREA-AVERAGED Fm(INCH/HR) =   0.08
 AREA-AVERAGED Fp(INCH/HR) =   0.80  AREA-AVERAGED Ap =   0.10
 TOTAL AREA(ACRES) =   25.25         PEAK FLOW RATE(CFS) =      60.40

 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) =  0.75   FLOOD WIDTH(FEET) =   59.85
 FLOW VELOCITY(FEET/SEC.) =   3.33   DEPTH*VELOCITY(FT*FT/SEC) =   2.50
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =  2005.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    106.00 TO NODE    115.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   989.00  DOWNSTREAM(FEET) =   985.00
 FLOW LENGTH(FEET) =    17.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  36.97
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     60.40
 PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =  16.25
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    115.00 =  2022.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    115.00 TO NODE    115.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =  16.25
 RAINFALL INTENSITY(INCH/HR) =   2.74
 AREA-AVERAGED Fm(INCH/HR) =  0.08
 AREA-AVERAGED Fp(INCH/HR) =  0.80
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =   25.25
 TOTAL STREAM AREA(ACRES) =   25.25
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     60.40

****************************************************************************
 FLOW PROCESS FROM NODE    110.00 TO NODE    111.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   810.00
 ELEVATION DATA: UPSTREAM(FEET) =   1006.20  DOWNSTREAM(FEET) =   1000.50

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.934
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.294
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                  A        1.05      0.80       0.10    52   11.93
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
 SUBAREA RUNOFF(CFS) =      3.04
 TOTAL AREA(ACRES) =      1.05   PEAK FLOW RATE(CFS) =      3.04

****************************************************************************
 FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =   9
----------------------------------------------------------------------------
 >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
 UPSTREAM NODE ELEVATION(FEET) =   1000.50
 DOWNSTREAM NODE ELEVATION(FEET) =    998.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   290.00
 "V" GUTTER WIDTH(FEET) =   3.00   GUTTER HIKE(FEET) =  0.170
 PAVEMENT LIP(FEET) =  0.013   MANNING'S N = .0150
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
 MAXIMUM DEPTH(FEET) =   0.67
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.002
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  A        1.30      0.80       0.10    52
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      4.75
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.42
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 AVERAGE FLOW DEPTH(FEET) =  0.34  FLOOD WIDTH(FEET) =  18.52
 "V" GUTTER FLOW TRAVEL TIME(MIN.) =  2.00  Tc(MIN.) =  13.93
 SUBAREA AREA(ACRES) =  1.30  SUBAREA RUNOFF(CFS) =  3.42
 EFFECTIVE AREA(ACRES) =  2.35  AREA-AVERAGED Fm(INCH/HR) =  0.08
 AREA-AVERAGED Fp(INCH/HR) =  0.80  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =  2.35  PEAK FLOW RATE(CFS) =  6.18

 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) =  0.36  FLOOD WIDTH(FEET) =  21.00
 FLOW VELOCITY(FEET/SEC.) =  2.52  DEPTH*VELOCITY(FT*FT/SEC) =  0.91
 LONGEST FLOWPATH FROM NODE  110.00 TO NODE  112.00 =  1100.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE  112.00 TO NODE  113.00 IS CODE =  9
----------------------------------------------------------------------------
 >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
 UPSTREAM NODE ELEVATION(FEET) =  998.00
 DOWNSTREAM NODE ELEVATION(FEET) =  996.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =  230.00
 "V" GUTTER WIDTH(FEET) =  3.00  GUTTER HIKE(FEET) =  0.170
 PAVEMENT LIP(FEET) =  0.013  MANNING'S N = .0150
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
 MAXIMUM DEPTH(FEET) =  0.67
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.832
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/  SCS SOIL  AREA  Fp  Ap  SCS
      LAND USE  GROUP  (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL  A  2.25  0.80  0.10  52
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =  8.97
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  2.70
 AVERAGE FLOW DEPTH(FEET) =  0.40  FLOOD WIDTH(FEET) =  24.80
 "V" GUTTER FLOW TRAVEL TIME(MIN.) =  1.42  Tc(MIN.) =  15.35
 SUBAREA AREA(ACRES) =  2.25  SUBAREA RUNOFF(CFS) =  5.57
 EFFECTIVE AREA(ACRES) =  4.60  AREA-AVERAGED Fm(INCH/HR) =  0.08
 AREA-AVERAGED Fp(INCH/HR) =  0.80  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =  4.60  PEAK FLOW RATE(CFS) =  11.39

 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) =  0.43  FLOOD WIDTH(FEET) =  27.47
 FLOW VELOCITY(FEET/SEC.) =  2.83  DEPTH*VELOCITY(FT*FT/SEC) =  1.21
 LONGEST FLOWPATH FROM NODE  110.00 TO NODE  113.00 =  1330.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE  113.00 TO NODE  114.00 IS CODE =  9
----------------------------------------------------------------------------
 >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
 UPSTREAM NODE ELEVATION(FEET) =  996.00
 DOWNSTREAM NODE ELEVATION(FEET) =  994.41
 CHANNEL LENGTH THRU SUBAREA(FEET) =  178.00
 "V" GUTTER WIDTH(FEET) =  3.00  GUTTER HIKE(FEET) =  0.170
 PAVEMENT LIP(FEET) =  0.013  MANNING'S N = .0150
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
 MAXIMUM DEPTH(FEET) =  0.67
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.729
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/  SCS SOIL  AREA  Fp  Ap  SCS
      LAND USE  GROUP  (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL  A  3.55  0.80  0.10  52
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =  15.62
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  3.04
 AVERAGE FLOW DEPTH(FEET) =  0.47  FLOOD WIDTH(FEET) =  31.28
 "V" GUTTER FLOW TRAVEL TIME(MIN.) =  0.98  Tc(MIN.) =  16.33
 SUBAREA AREA(ACRES) =  3.55  SUBAREA RUNOFF(CFS) =  8.47
 EFFECTIVE AREA(ACRES) =  8.15  AREA-AVERAGED Fm(INCH/HR) =  0.08
 AREA-AVERAGED Fp(INCH/HR) =  0.80  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =  8.15  PEAK FLOW RATE(CFS) =  19.43

 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) =  0.49  FLOOD WIDTH(FEET) =  34.14
 FLOW VELOCITY(FEET/SEC.) =  3.20  DEPTH*VELOCITY(FT*FT/SEC) =  1.58
 LONGEST FLOWPATH FROM NODE  110.00 TO NODE  114.00 =  1508.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE  114.00 TO NODE  115.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  990.00  DOWNSTREAM(FEET) =  985.00
 FLOW LENGTH(FEET) =  720.00  MANNING'S N =  0.012
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  19.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  7.22
 ESTIMATED PIPE DIAMETER(INCH) =  24.00  NUMBER OF PIPES =  1
 PIPE-FLOW(CFS) =  19.43
 PIPE TRAVEL TIME(MIN.) =  1.66  Tc(MIN.) =  17.99
 LONGEST FLOWPATH FROM NODE  110.00 TO NODE  115.00 =  2228.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE  115.00 TO NODE  115.00 IS CODE =  1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
```

```
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =  17.99
 RAINFALL INTENSITY(INCH/HR) =   2.57
 AREA-AVERAGED Fm(INCH/HR) =  0.08
 AREA-AVERAGED Fp(INCH/HR) =  0.80
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =    8.15
 TOTAL STREAM AREA(ACRES) =    8.15
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     19.43

 ** CONFLUENCE DATA **
  STREAM     Q      Tc   Intensity   Fp(Fm)      Ap   Ae      HEADWATER
  NUMBER   (CFS)  (MIN.) (INCH/HR) (INCH/HR)        (ACRES)     NODE
     1     60.40  16.25    2.737  0.80( 0.08) 0.10     25.3      100.00
     2     19.43  17.99    2.575  0.80( 0.08) 0.10      8.1      110.00

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

 ** PEAK FLOW RATE TABLE **
  STREAM     Q      Tc   Intensity   Fp(Fm)      Ap   Ae      HEADWATER
  NUMBER   (CFS)  (MIN.) (INCH/HR) (INCH/HR)        (ACRES)     NODE
     1     79.10  16.25    2.737  0.80( 0.08) 0.10     32.6      100.00
     2     76.16  17.99    2.575  0.80( 0.08) 0.10     33.4      110.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =     79.10    Tc(MIN.) =    16.25
 EFFECTIVE AREA(ACRES) =    32.61   AREA-AVERAGED Fm(INCH/HR) =  0.08
 AREA-AVERAGED Fp(INCH/HR) =  0.80  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =     33.40
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    115.00 =  2228.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    115.00 TO NODE    116.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   985.00  DOWNSTREAM(FEET) =   983.00
 FLOW LENGTH(FEET) =   510.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  45.0 INCH PIPE IS  36.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   8.25
 ESTIMATED PIPE DIAMETER(INCH) =  45.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     79.10
 PIPE TRAVEL TIME(MIN.) =   1.03    Tc(MIN.) =  17.28
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    116.00 =  2738.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    116.00 TO NODE    116.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  17.28
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.638
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "GRASS"                     A        2.45      0.55       1.00    70
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.55
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.00
 SUBAREA AREA(ACRES) =     2.45     SUBAREA RUNOFF(CFS) =     4.60
 EFFECTIVE AREA(ACRES) =    35.06   AREA-AVERAGED Fm(INCH/HR) =  0.11
 AREA-AVERAGED Fp(INCH/HR) =  0.69  AREA-AVERAGED Ap =  0.16
 TOTAL AREA(ACRES) =    35.85       PEAK FLOW RATE(CFS) =      79.69

****************************************************************************
 FLOW PROCESS FROM NODE    116.00 TO NODE    116.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =  17.28
 RAINFALL INTENSITY(INCH/HR) =   2.64
 AREA-AVERAGED Fm(INCH/HR) =  0.11
 AREA-AVERAGED Fp(INCH/HR) =  0.69
 AREA-AVERAGED Ap =  0.16
 EFFECTIVE STREAM AREA(ACRES) =   35.06
 TOTAL STREAM AREA(ACRES) =   35.85
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     79.69

****************************************************************************
 FLOW PROCESS FROM NODE    120.00 TO NODE    121.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   738.00
 ELEVATION DATA: UPSTREAM(FEET) =   1009.27  DOWNSTREAM(FEET) =   1001.50

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.608
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.535
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                  A        3.25      0.80       0.10    52   10.61
```

```
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
 SUBAREA RUNOFF(CFS) =     10.11
 TOTAL AREA(ACRES) =      3.25   PEAK FLOW RATE(CFS) =     10.11

****************************************************************************
 FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =   9
----------------------------------------------------------------------------
 >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
 UPSTREAM NODE ELEVATION(FEET) =   1001.50
 DOWNSTREAM NODE ELEVATION(FEET) =    998.40
 CHANNEL LENGTH THRU SUBAREA(FEET) =   214.00
 "V" GUTTER WIDTH(FEET) =   3.00   GUTTER HIKE(FEET) =  0.170
 PAVEMENT LIP(FEET) =  0.013   MANNING'S N = .0150
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
 MAXIMUM DEPTH(FEET) =   0.50
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.351
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 A        2.60      0.80       0.10    52
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     13.94
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.61
 AVERAGE FLOW DEPTH(FEET) =   0.42   FLOOD WIDTH(FEET) =   26.87
 "V" GUTTER FLOW TRAVEL TIME(MIN.) =   0.99   Tc(MIN.) =  11.60
 SUBAREA AREA(ACRES) =    2.60       SUBAREA RUNOFF(CFS) =    7.66
 EFFECTIVE AREA(ACRES) =    5.85     AREA-AVERAGED Fm(INCH/HR) =   0.08
 AREA-AVERAGED Fp(INCH/HR) =   0.80  AREA-AVERAGED Ap =   0.10
 TOTAL AREA(ACRES) =    5.85         PEAK FLOW RATE(CFS) =      17.23

 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) =  0.45   FLOOD WIDTH(FEET) =   29.35
 FLOW VELOCITY(FEET/SEC.) =   3.78   DEPTH*VELOCITY(FT*FT/SEC) =   1.69
 LONGEST FLOWPATH FROM NODE    120.00 TO NODE    122.00 =   952.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    122.00 TO NODE    123.00 IS CODE =  61
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  998.40  DOWNSTREAM ELEVATION(FEET) =  995.75
 STREET LENGTH(FEET) =   455.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 25.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL) =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0148
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      23.76
   ***STREET FLOW SPLITS OVER STREET-CROWN***
   FULL DEPTH(FEET) =    0.66   FLOOD WIDTH(FEET) =   25.00
   FULL HALF-STREET VELOCITY(FEET/SEC.) =    3.05
   SPLIT DEPTH(FEET) =    0.43   SPLIT FLOOD WIDTH(FEET) =   13.40
   SPLIT FLOW(CFS) =    4.15   SPLIT VELOCITY(FEET/SEC.) =    2.09
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.66
   HALFSTREET FLOOD WIDTH(FEET) =   25.00
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.05
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    2.00
 STREET FLOW TRAVEL TIME(MIN.) =   2.49   Tc(MIN.) =  14.09
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.982
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 A        5.00      0.80       0.10    52
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
 SUBAREA AREA(ACRES) =    5.00       SUBAREA RUNOFF(CFS) =   13.06
 EFFECTIVE AREA(ACRES) =   10.85     AREA-AVERAGED Fm(INCH/HR) =  0.08
 AREA-AVERAGED Fp(INCH/HR) =  0.80  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =   10.85         PEAK FLOW RATE(CFS) =      28.34

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.66   HALFSTREET FLOOD WIDTH(FEET) =  25.00
 FLOW VELOCITY(FEET/SEC.) =  3.05   DEPTH*VELOCITY(FT*FT/SEC.) =   2.00
 LONGEST FLOWPATH FROM NODE    120.00 TO NODE    123.00 =  1407.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    123.00 TO NODE    124.00 IS CODE =  61
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  995.75  DOWNSTREAM ELEVATION(FEET) =  993.75
 STREET LENGTH(FEET) =   400.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 25.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) =  0.020
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 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0148
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      34.28
   ***STREET FLOW SPLITS OVER STREET-CROWN***
   FULL DEPTH(FEET) =    0.66   FLOOD WIDTH(FEET) =   25.00
   FULL HALF-STREET VELOCITY(FEET/SEC.) =    2.82
   SPLIT DEPTH(FEET) =    0.64   SPLIT FLOOD WIDTH(FEET) =   23.87
   SPLIT FLOW(CFS) =   16.11   SPLIT VELOCITY(FEET/SEC.) =    2.74
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.66
   HALFSTREET FLOOD WIDTH(FEET) =   25.00
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.82
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.86
 STREET FLOW TRAVEL TIME(MIN.) =   2.36   Tc(MIN.) =  16.45
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.717
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  A        5.00      0.80       0.10    52
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
 SUBAREA AREA(ACRES) =    5.00      SUBAREA RUNOFF(CFS) =   11.87
 EFFECTIVE AREA(ACRES) =   15.85    AREA-AVERAGED Fm(INCH/HR) =  0.08
 AREA-AVERAGED Fp(INCH/HR) =  0.80  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =   15.85        PEAK FLOW RATE(CFS) =      37.63

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.66   HALFSTREET FLOOD WIDTH(FEET) =  25.00
 FLOW VELOCITY(FEET/SEC.) =  2.86   DEPTH*VELOCITY(FT*FT/SEC.) =   1.90
 LONGEST FLOWPATH FROM NODE    120.00 TO NODE    124.00 =  1807.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    124.00 TO NODE    125.00 IS CODE =  61
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  993.75  DOWNSTREAM ELEVATION(FEET) =  991.50
 STREET LENGTH(FEET) =   384.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 25.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0148
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      43.15
   ***STREET FLOWING FULL***
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.67
   HALFSTREET FLOOD WIDTH(FEET) =   25.34
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.16
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    2.13
 STREET FLOW TRAVEL TIME(MIN.) =   2.02   Tc(MIN.) =  18.47
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.535
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  A        5.00      0.80       0.10    52
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
 SUBAREA AREA(ACRES) =    5.00      SUBAREA RUNOFF(CFS) =   11.05
 EFFECTIVE AREA(ACRES) =   20.85    AREA-AVERAGED Fm(INCH/HR) =  0.08
 AREA-AVERAGED Fp(INCH/HR) =  0.80  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =   20.85        PEAK FLOW RATE(CFS) =      46.07

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.68   HALFSTREET FLOOD WIDTH(FEET) =  25.83
 FLOW VELOCITY(FEET/SEC.) =  3.26   DEPTH*VELOCITY(FT*FT/SEC.) =   2.23
 LONGEST FLOWPATH FROM NODE    120.00 TO NODE    125.00 =  2191.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    125.00 TO NODE    126.00 IS CODE =  61
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  991.50  DOWNSTREAM ELEVATION(FEET) =  989.20
 STREET LENGTH(FEET) =   273.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 25.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0148
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      50.53
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```
 ***STREET FLOWING FULL***
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) =  0.67
 HALFSTREET FLOOD WIDTH(FEET) =   25.10
 AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.77
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    2.52
STREET FLOW TRAVEL TIME(MIN.) =   1.21   Tc(MIN.) =  19.68
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.440
SUBAREA LOSS RATE DATA(AMC III):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL                 A        4.20      0.80        0.10    52
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
SUBAREA AREA(ACRES) =    4.20      SUBAREA RUNOFF(CFS) =    8.92
EFFECTIVE AREA(ACRES) =   25.05    AREA-AVERAGED Fm(INCH/HR) =  0.08
AREA-AVERAGED Fp(INCH/HR) =  0.80  AREA-AVERAGED Ap =  0.10
TOTAL AREA(ACRES) =   25.05        PEAK FLOW RATE(CFS) =      53.22

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.68   HALFSTREET FLOOD WIDTH(FEET) =  25.52
FLOW VELOCITY(FEET/SEC.) =  3.85   DEPTH*VELOCITY(FT*FT/SEC.) =   2.61
LONGEST FLOWPATH FROM NODE    120.00 TO NODE    126.00 =  2464.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    126.00 TO NODE    127.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   985.20  DOWNSTREAM(FEET) =   983.00
FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.012
DEPTH OF FLOW IN  30.0 INCH PIPE IS  20.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =  14.63
ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =     53.22
PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =  19.79
LONGEST FLOWPATH FROM NODE    120.00 TO NODE    127.00 =  2564.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    128.00 TO NODE    128.00 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.) =  19.79
RAINFALL INTENSITY(INCH/HR) =   2.43
AREA-AVERAGED Fm(INCH/HR) =  0.08
AREA-AVERAGED Fp(INCH/HR) =  0.80
AREA-AVERAGED Ap =  0.10
EFFECTIVE STREAM AREA(ACRES) =   25.05
TOTAL STREAM AREA(ACRES) =   25.05
PEAK FLOW RATE(CFS) AT CONFLUENCE =     53.22

** CONFLUENCE DATA **
 STREAM     Q      Tc    Intensity   Fp(Fm)      Ap    Ae      HEADWATER
 NUMBER   (CFS)  (MIN.) (INCH/HR)  (INCH/HR)          (ACRES)    NODE
    1     79.69  17.28     2.638   0.69( 0.11) 0.16     35.1      100.00
    1     76.74  19.02     2.490   0.69( 0.11) 0.16     35.9      110.00
    2     53.22  19.79     2.432   0.80( 0.08) 0.10     25.0      120.00

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

** PEAK FLOW RATE TABLE **
 STREAM     Q      Tc    Intensity   Fp(Fm)      Ap    Ae      HEADWATER
 NUMBER   (CFS)  (MIN.) (INCH/HR)  (INCH/HR)          (ACRES)    NODE
    1    130.23  17.28     2.638   0.72( 0.10) 0.14     56.9      100.00
    2    129.16  19.02     2.490   0.72( 0.10) 0.14     59.9      110.00
    3    128.07  19.79     2.432   0.72( 0.10) 0.14     60.9      120.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =    130.23    Tc(MIN.) =    17.28
EFFECTIVE AREA(ACRES) =    56.93   AREA-AVERAGED Fm(INCH/HR) =  0.10
AREA-AVERAGED Fp(INCH/HR) =  0.72  AREA-AVERAGED Ap =  0.14
TOTAL AREA(ACRES) =     60.90
LONGEST FLOWPATH FROM NODE    110.00 TO NODE    128.00 =  2738.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    128.00 TO NODE    316.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   984.46  DOWNSTREAM(FEET) =   983.91
FLOW LENGTH(FEET) =   110.00   MANNING'S N =  0.012
DEPTH OF FLOW IN  54.0 INCH PIPE IS  39.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =  10.43
ESTIMATED PIPE DIAMETER(INCH) =  54.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =    130.23
PIPE TRAVEL TIME(MIN.) =   0.18    Tc(MIN.) =  17.46
LONGEST FLOWPATH FROM NODE    110.00 TO NODE    316.00 =  2848.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    316.00 TO NODE    316.00 IS CODE =  10
----------------------------------------------------------------------------
>>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
```

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==============================================================================

******************************************************************************
 FLOW PROCESS FROM NODE     300.00 TO NODE     303.00 IS CODE =   7
------------------------------------------------------------------------------
 >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
==============================================================================
 USER-SPECIFIED VALUES ARE AS FOLLOWS:
 TC(MIN.) =  38.90   RAINFALL INTENSITY(INCH/HR) =  1.62
 EFFECTIVE AREA(ACRES) =     9.50
 TOTAL AREA(ACRES) =     9.50         PEAK FLOW RATE(CFS) =      8.40
 AREA-AVERAGED Fm(INCH/HR) =   0.78  AREA-AVERAGED Fp(INCH/HR) =   0.78
 AREA-AVERAGED Ap =  1.00
 NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
       CONFLUENCE ANALYSES.

******************************************************************************
 FLOW PROCESS FROM NODE     303.00 TO NODE     315.00 IS CODE =  31
------------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   995.70  DOWNSTREAM(FEET) =   992.70
 FLOW LENGTH(FEET) =   595.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.36
 ESTIMATED PIPE DIAMETER(INCH) =  21.00     NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      8.40
 PIPE TRAVEL TIME(MIN.) =   1.85     Tc(MIN.) =  40.75
 LONGEST FLOWPATH FROM NODE     110.00 TO NODE     315.00 =  3443.00 FEET.

******************************************************************************
 FLOW PROCESS FROM NODE     315.00 TO NODE     315.00 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.) =  40.75
 RAINFALL INTENSITY(INCH/HR) =   1.58
 AREA-AVERAGED Fm(INCH/HR) =  0.78
 AREA-AVERAGED Fp(INCH/HR) =  0.78
 AREA-AVERAGED Ap =  1.00
 EFFECTIVE STREAM AREA(ACRES) =    9.50
 TOTAL STREAM AREA(ACRES) =    9.50
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.40

******************************************************************************
 FLOW PROCESS FROM NODE     310.00 TO NODE     314.00 IS CODE =   7
------------------------------------------------------------------------------
 >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
==============================================================================
 USER-SPECIFIED VALUES ARE AS FOLLOWS:
 TC(MIN.) =  27.00   RAINFALL INTENSITY(INCH/HR) =  2.02
 EFFECTIVE AREA(ACRES) =    22.95
 TOTAL AREA(ACRES) =    22.95         PEAK FLOW RATE(CFS) =     30.40
 AREA-AVERAGED Fm(INCH/HR) =   0.60  AREA-AVERAGED Fp(INCH/HR) =   0.75
 AREA-AVERAGED Ap =  0.80
 NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
       CONFLUENCE ANALYSES.

******************************************************************************
 FLOW PROCESS FROM NODE     314.00 TO NODE     315.00 IS CODE =  31
------------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   995.00  DOWNSTREAM(FEET) =   992.70
 FLOW LENGTH(FEET) =   460.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  30.0 INCH PIPE IS  24.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.11
 ESTIMATED PIPE DIAMETER(INCH) =  30.00     NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     30.40
 PIPE TRAVEL TIME(MIN.) =   1.08     Tc(MIN.) =  28.08
 LONGEST FLOWPATH FROM NODE     310.00 TO NODE     315.00 =  3024.00 FEET.

******************************************************************************
 FLOW PROCESS FROM NODE     315.00 TO NODE     315.00 IS CODE =   1
------------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
==============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =  28.08
 RAINFALL INTENSITY(INCH/HR) =   1.97
 AREA-AVERAGED Fm(INCH/HR) =  0.60
 AREA-AVERAGED Fp(INCH/HR) =  0.75
 AREA-AVERAGED Ap =  0.80
 EFFECTIVE STREAM AREA(ACRES) =   22.95
 TOTAL STREAM AREA(ACRES) =   22.95
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     30.40

 ** CONFLUENCE DATA **
  STREAM      Q      Tc    Intensity   Fp(Fm)      Ap    Ae      HEADWATER
  NUMBER    (CFS)  (MIN.)  (INCH/HR)  (INCH/HR)         (ACRES)     NODE
     1       8.40  40.75     1.577   0.78( 0.78) 1.00      9.5      110.00
     2      30.40  28.08     1.971   0.75( 0.60) 0.80     23.0      310.00
```

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

 ** PEAK FLOW RATE TABLE **
  STREAM     Q      Tc   Intensity   Fp(Fm)      Ap   Ae      HEADWATER
  NUMBER   (CFS) (MIN.) (INCH/HR) (INCH/HR)        (ACRES)     NODE
     1     30.05  40.75    1.577  0.76( 0.65) 0.86    32.5      110.00
     2     38.80  28.08    1.971  0.76( 0.64) 0.84    29.5      310.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =     38.80    Tc(MIN.) =    28.08
 EFFECTIVE AREA(ACRES) =    29.50   AREA-AVERAGED Fm(INCH/HR) =  0.64
 AREA-AVERAGED Fp(INCH/HR) =  0.76  AREA-AVERAGED Ap =  0.84
 TOTAL AREA(ACRES) =     32.45
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    315.00 =  3443.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    315.00 TO NODE    316.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   992.70  DOWNSTREAM(FEET) =   990.00
 FLOW LENGTH(FEET) =  1050.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  39.0 INCH PIPE IS  28.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.01
 ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     38.80
 PIPE TRAVEL TIME(MIN.) =   2.91    Tc(MIN.) =  30.99
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    316.00 =  4493.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    316.00 TO NODE    316.00 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     38.80  30.99    1.858  0.76( 0.64) 0.84    29.5      310.00
     2     30.05  43.84    1.509  0.76( 0.65) 0.86    32.5      110.00
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    316.00 =  4493.00 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    130.23  17.46    2.622  0.72( 0.10) 0.14    56.9      100.00
     2    129.16  19.20    2.477  0.72( 0.10) 0.14    59.9      110.00
     3    128.07  19.97    2.419  0.72( 0.10) 0.14    60.9      120.00
 LONGEST FLOWPATH FROM NODE      0.00 TO NODE    316.00 =     0.00 FEET.

 ** PEAK FLOW RATE TABLE **
  STREAM     Q      Tc   Intensity   Fp(Fm)      Ap   Ae      HEADWATER
  NUMBER   (CFS) (MIN.) (INCH/HR) (INCH/HR)        (ACRES)     NODE
     1    135.92  30.99    1.858  0.75( 0.28) 0.37    90.4      310.00
     2    107.90  43.84    1.509  0.75( 0.29) 0.39    93.4      110.00
     3    165.79  17.46    2.622  0.74( 0.22) 0.30    73.6      100.00
     4    165.40  19.20    2.477  0.75( 0.23) 0.30    78.2      110.00
     5    164.58  19.97    2.419  0.75( 0.23) 0.30    79.9      120.00
   TOTAL AREA(ACRES) =     93.35

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =    165.79  Tc(MIN.) =   17.458
 EFFECTIVE AREA(ACRES) =    73.55  AREA-AVERAGED Fm(INCH/HR) =  0.22
 AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.30
 TOTAL AREA(ACRES) =     93.35
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    316.00 =  4493.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    316.00 TO NODE    317.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   990.10  DOWNSTREAM(FEET) =   989.80
 FLOW LENGTH(FEET) =    90.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  63.0 INCH PIPE IS  47.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   9.47
 ESTIMATED PIPE DIAMETER(INCH) =  63.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =    165.79
 PIPE TRAVEL TIME(MIN.) =   0.16    Tc(MIN.) =  17.62
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    317.00 =  4583.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =     93.35  TC(MIN.) =     17.62
 EFFECTIVE AREA(ACRES) =     73.55  AREA-AVERAGED Fm(INCH/HR)=  0.22
 AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.30
 PEAK FLOW RATE(CFS)    =    165.79

 ** PEAK FLOW RATE TABLE **
  STREAM     Q      Tc   Intensity   Fp(Fm)      Ap   Ae      HEADWATER
  NUMBER   (CFS) (MIN.) (INCH/HR) (INCH/HR)        (ACRES)     NODE
     1    165.79  17.62    2.608  0.74( 0.22) 0.30    73.6      100.00
     2    165.40  19.36    2.464  0.75( 0.23) 0.30    78.2      110.00
     3    164.58  20.13    2.407  0.75( 0.23) 0.30    79.9      120.00
     4    135.92  31.16    1.852  0.75( 0.28) 0.37    90.4      310.00
     5    107.90  44.02    1.505  0.75( 0.29) 0.39    93.4      110.00
============================================================================
```

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

1

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
         (c) Copyright 1983-99 Advanced Engineering Software (aes)
             Ver. 8.0  Release Date: 01/01/99  License ID 1435

                         Analysis prepared by:

                           THIENES ENGINEERING
                         16800 VALLEY VIEW AVENUE
                           LA MIRADA CA 90638
                    PH: (714) 521-4811 FAX: (714) 521-4173

 ************************** DESCRIPTION OF STUDY **************************
* TEI JOB NO 3412                                                        *
* STREET IN ACCESS ROAD NORTH OF DUMAS                                   *
* 100 YEAR STORM EVENT                                                   *
 ************************************************************************

  FILE NAME: C:\XDRIVE\3412\420.DAT
  TIME/DATE OF STUDY: 10:00 03/21/2017
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  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) = 1.2500

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


**************************************************************************
  FLOW PROCESS FROM NODE    420.00 TO NODE    421.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =  1000.00
  ELEVATION DATA: UPSTREAM(FEET) =   1004.00  DOWNSTREAM(FEET) =    999.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.902
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.006
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        1.20      0.80       0.10    52   13.90
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.80
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
  SUBAREA RUNOFF(CFS) =      3.16
  TOTAL AREA(ACRES) =      1.20   PEAK FLOW RATE(CFS) =      3.16
==========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =      1.20  TC(MIN.) =     13.90
  EFFECTIVE AREA(ACRES) =       1.20  AREA-AVERAGED Fm(INCH/HR)=  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.80  AREA-AVERAGED Ap =  0.10
  PEAK FLOW RATE(CFS)    =      3.16
==========================================================================
==========================================================================
  END OF RATIONAL METHOD ANALYSIS

1
```

APPENDIX C

HYDRAULIC CALCULATIONS

DATE: 3/23/2017
TIME: 11:19

F0515P

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	48	4			4.00														
CD	36	4			3.00														
CD	18	4			1.50														
CD	42	4			3.50														

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

TEI JOB NO 3412

HEADING LINE NO 2 IS -

SD LINE A

HEADING LINE NO 3 IS -

100 YEAR

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET

U/S DATA STATION	INVERT	SECT	W S ELEV
1158.07	985.48	48	988.14

ELEMENT NO 2 IS A REACH

U/S DATA STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
1182.35	985.54	48	0.012	0.00	0.00	0.00	0

ELEMENT NO 3 IS A REACH

U/S DATA STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
1196.10	985.58	48	0.012	22.50	35.00	0.00	0

ELEMENT NO 4 IS A REACH

U/S DATA STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
1233.16	985.67	48	0.012	0.00	0.00	0.00	0

ELEMENT NO 5 IS A REACH

U/S DATA STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
1246.90	985.70	48	0.012	22.50	35.00	0.00	0

ELEMENT NO 6 IS A REACH

U/S DATA STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
1253.06	985.80	48	0.012	0.00	0.00	0.00	0

ELEMENT NO 7 IS A JUNCTION

U/S DATA STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
1253.06	985.80	36	36	0	0.012	42.1	0.0	986.20	0.00	45.00	0.00

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 8 IS A REACH

U/S DATA STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
1605.28	986.68	36	0.012	0.00	0.00	0.00	0

ELEMENT NO 9 IS A REACH

U/S DATA STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
1609.44	986.78	36	0.012	0.00	0.00	0.00	1

ELEMENT NO 10 IS A REACH

U/S DATA STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
1943.16	987.62	36	0.012	0.00	0.00	0.00	0

ELEMENT NO 11 IS A REACH

U/S DATA STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
1947.32	987.72	36	0.012	0.00	0.00	0.00	1

ELEMENT NO 12 IS A REACH

U/S DATA STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
1976.70	987.79	36	0.012	0.00	0.00	0.00	0

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 13 IS A REACH

U/S DATA STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
1983.08	987.81	36	0.012	45.00	8.00	0.00	0

ELEMENT NO 14 IS A REACH

U/S DATA STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
2300.65	988.60	36	0.012	0.00	0.00	0.00	0

ELEMENT NO 15 IS A JUNCTION

U/S DATA STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
2300.65	988.60	36	18	0	0.012	8.4	0.0	989.10	0.00	45.00	0.00

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 16 IS A REACH	*	*	*						
U/S DATA	STATION	INVERT	SECT	N			RADIUS	ANGLE	ANG PT	MAN H
	2352.28	988.73	36	0.012			0.00	0.00	0.00	0
ELEMENT NO 17 IS A REACH	*	*	*							
U/S DATA	STATION	INVERT	SECT	N			RADIUS	ANGLE	ANG PT	MAN H
	2356.44	988.83	36	0.012			0.00	0.00	0.00	1
ELEMENT NO 18 IS A REACH	*	*	*							
U/S DATA	STATION	INVERT	SECT	N			RADIUS	ANGLE	ANG PT	MAN H
	2396.31	988.93	36	0.012			0.00	0.00	0.00	0
ELEMENT NO 19 IS A REACH	*	*	*							
U/S DATA	STATION	INVERT	SECT	N			RADIUS	ANGLE	ANG PT	MAN H
	2470.00	989.11	36	0.012			200.00	21.00	0.00	0
ELEMENT NO 20 IS A REACH	*	*	*							
U/S DATA	STATION	INVERT	SECT	N			RADIUS	ANGLE	ANG PT	MAN H
	2761.40	989.84	36	0.012			0.00	0.00	0.00	0
ELEMENT NO 21 IS A SYSTEM HEADWORKS			*		*					
U/S DATA	STATION	INVERT	SECT			W S ELEV				
	2761.40	989.84	36			0.00				

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

WATER SURFACE PROFILE LISTING

TEI JOB NO 3412
SD LINE A
100 YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1158.07	985.48	2.725	988.205	80.9	8.87	1.222	989.427	0.00	2.725		4.00	0.00	0.00	0	0.00
6.88	0.00247					.003921	0.03			3.472			0.00		
1164.95	985.50	2.846	988.343	80.9	8.46	1.111	989.454	0.00	2.725		4.00	0.00	0.00	0	0.00
17.40	0.00247					.003558	0.06			3.472			0.00		
1182.35	985.54	2.937	988.477	80.9	8.18	1.039	989.516	0.00	2.725		4.00	0.00	0.00	0	0.00
13.75	0.00291					.003385	0.05			3.155			0.00		
1196.10	985.58	2.961	988.541	80.9	8.11	1.021	989.562	0.00	2.725		4.00	0.00	0.00	0	0.00
37.06	0.00243					.003236	0.12			3.523			0.00		
1233.16	985.67	3.054	988.724	80.9	7.86	0.959	989.683	0.00	2.725		4.00	0.00	0.00	0	0.00
13.74	0.00218					.003084	0.04			4.000			0.00		
1246.90	985.70	3.087	988.787	80.9	7.77	0.938	989.725	0.00	2.725		4.00	0.00	0.00	0	0.00
3.62	0.01623					.003220	0.01			1.780			0.00		
1250.52	985.76	2.946	988.705	80.9	8.15	1.032	989.737	0.00	2.725		4.00	0.00	0.00	0	0.00
2.01	0.01623					.003594	0.01			1.780			0.00		
1252.53	985.79	2.817	988.609	80.9	8.55	1.136	989.745	0.00	2.725		4.00	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00		
1252.53	985.79	2.611	988.403	80.9	9.31	1.346	989.749	0.00	2.725		4.00	0.00	0.00	0	0.00
0.53	0.01623					.004406	0.00			1.780			0.00		
1253.06	985.80	2.725	988.525	80.9	8.87	1.222	989.747	0.00	2.725		4.00	0.00	0.00	0	0.00
JUNCT STR	0.00000					.003514	0.00						0.00		
1253.06	985.80	3.982	989.782	38.8	5.49	0.468	990.250	0.00	2.028		3.00	0.00	0.00	0	0.00
352.22	0.00250					.002883	1.02			2.770			0.00		

WATER SURFACE PROFILE LISTING

TEI JOB NO 3412
SD LINE A
100 YEAR

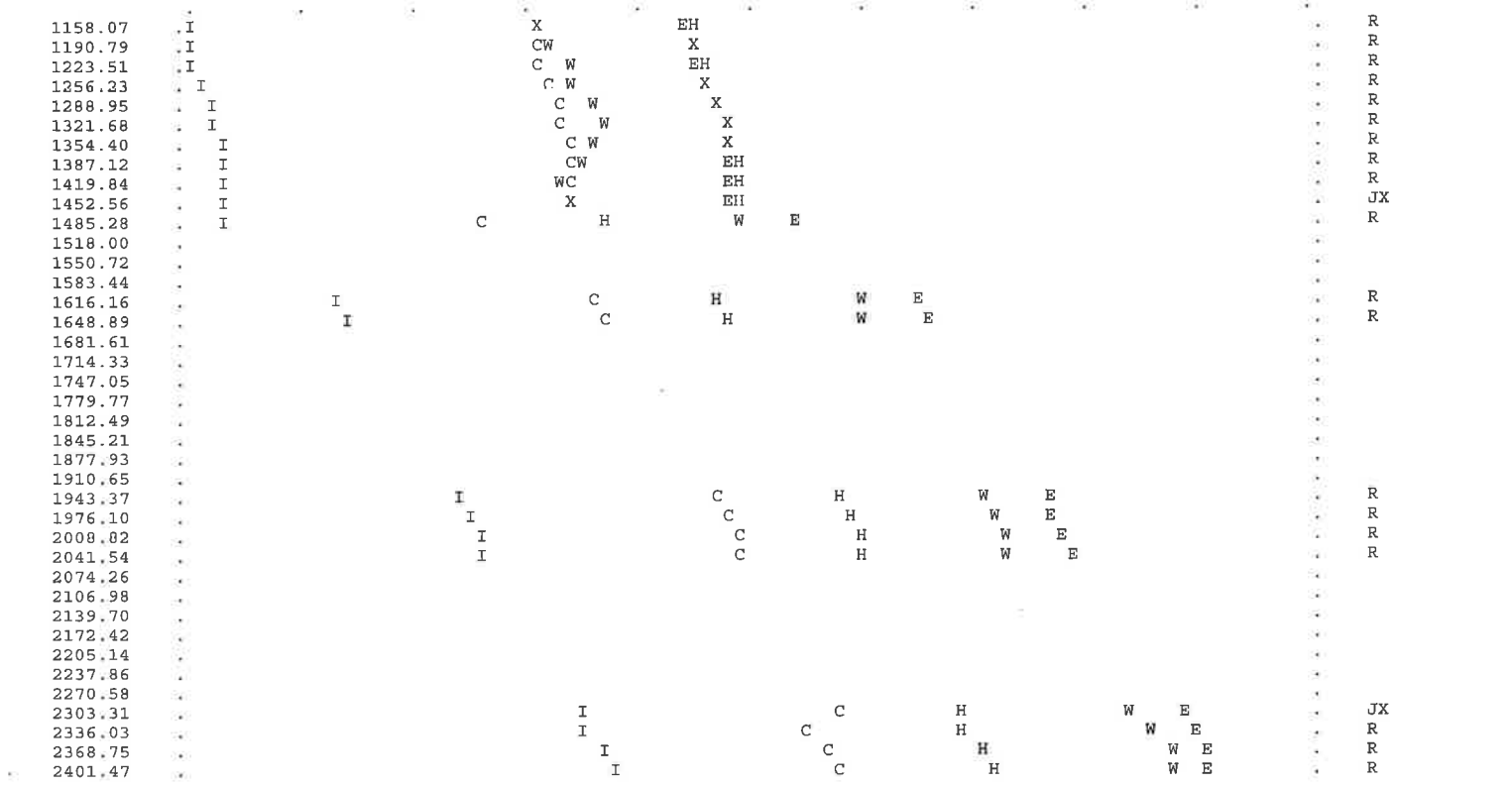
STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1605.28	986.68	4.117	990.797	38.8	5.49	0.468	991.265	0.00	2.028		3.00	0.00	0.00	0	0.00
4.16	0.02404					.002883	0.01			1.217			0.00		
1609.44	986.78	4.053	990.833	38.8	5.49	0.468	991.301	0.00	2.028		3.00	0.00	0.00	0	0.00
333.72	0.00252					.002883	0.96			2.730			0.00		

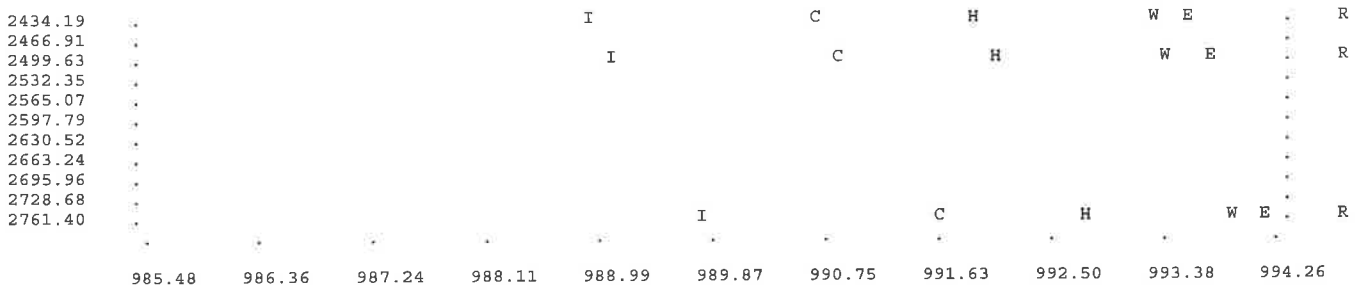
1943.16	987.62	4.175	991.795	38.8	5.49	0.468	992.263	0.00	2.028		3.00	0.00	0.00	0	0.00
4.16	0.02404					.002883	0.01			1.217			0.00		
1947.32	987.72	4.110	991.830	38.8	5.49	0.468	992.298	0.00	2.028		3.00	0.00	0.00	0	0.00
29.38	0.00238					.002883	0.08			3.000			0.00		
1976.70	987.79	4.125	991.915	38.8	5.49	0.468	992.383	0.00	2.028		3.00	0.00	0.00	0	0.00
6.38	0.00314					.002883	0.02			2.354			0.00		
1983.08	987.81	4.151	991.961	38.8	5.49	0.468	992.429	0.00	2.028		3.00	0.00	0.00	0	0.00
317.57	0.00249					.002883	0.92			3.000			0.00		
2300.65	988.60	4.277	992.877	38.8	5.49	0.468	993.345	0.00	2.028		3.00	0.00	0.00	0	0.00
JUNCT STR	0.00000					.002327	0.00						0.00		
2300.65	988.60	4.514	993.114	30.4	4.30	0.287	993.401	0.00	1.787		3.00	0.00	0.00	0	0.00
51.63	0.00252					.001770	0.09			2.101			0.00		
2352.28	988.73	4.476	993.206	30.4	4.30	0.287	993.493	0.00	1.787		3.00	0.00	0.00	0	0.00
4.16	0.02404					.001770	0.01			1.066			0.00		
2356.44	988.83	4.397	993.227	30.4	4.30	0.287	993.514	0.00	1.787		3.00	0.00	0.00	0	0.00
39.87	0.00251					.001770	0.07			2.104			0.00		
2396.31	988.93	4.368	993.298	30.4	4.30	0.287	993.585	0.00	1.787		3.00	0.00	0.00	0	0.00
73.69	0.00244					.001770	0.13			2.126			0.00		

TEI JOB NO 3412
SD LINE A
100 YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
2470.00	989.11	4.346	993.456	30.4	4.30	0.287	993.743	0.00	1.787		3.00	0.00	0.00	0	0.00
291.40	0.00250					.001770	0.52			2.105			0.00		
2761.40	989.84	4.132	993.972	30.4	4.30	0.287	994.259	0.00	1.787		3.00	0.00	0.00	0	0.00

TEI JOB NO 3412
SD LINE A
100 YEAR





N O T E S

1. GLOSSARY
   - I = INVERT ELEVATION
   - C = CRITICAL DEPTH
   - W = WATER SURFACE ELEVATION
   - H = HEIGHT OF CHANNEL
   - E = ENERGY GRADE LINE
   - X = CURVES CROSSING OVER
   - B = BRIDGE ENTRANCE OR EXIT
   - Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY□

DATE: 3/23/2017
TIME: 11:22

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	36	4			3.00														

F 0 5 1 5 P PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

TEI JOB NO 3412

HEADING LINE NO 2 IS -

SD LINE A1

HEADING LINE NO 3 IS -

100 YEAR

F 0 5 1 5 P PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1004.09	986.20	36	988.53

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1075.00	986.56	36	0.012	0.00	0.00	0.00	0

ELEMENT NO 3 IS A SYSTEM HEADWORKS * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1075.00	986.56	36	0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC
LICENSEE: THIENES ENGINEERING PAGE 1

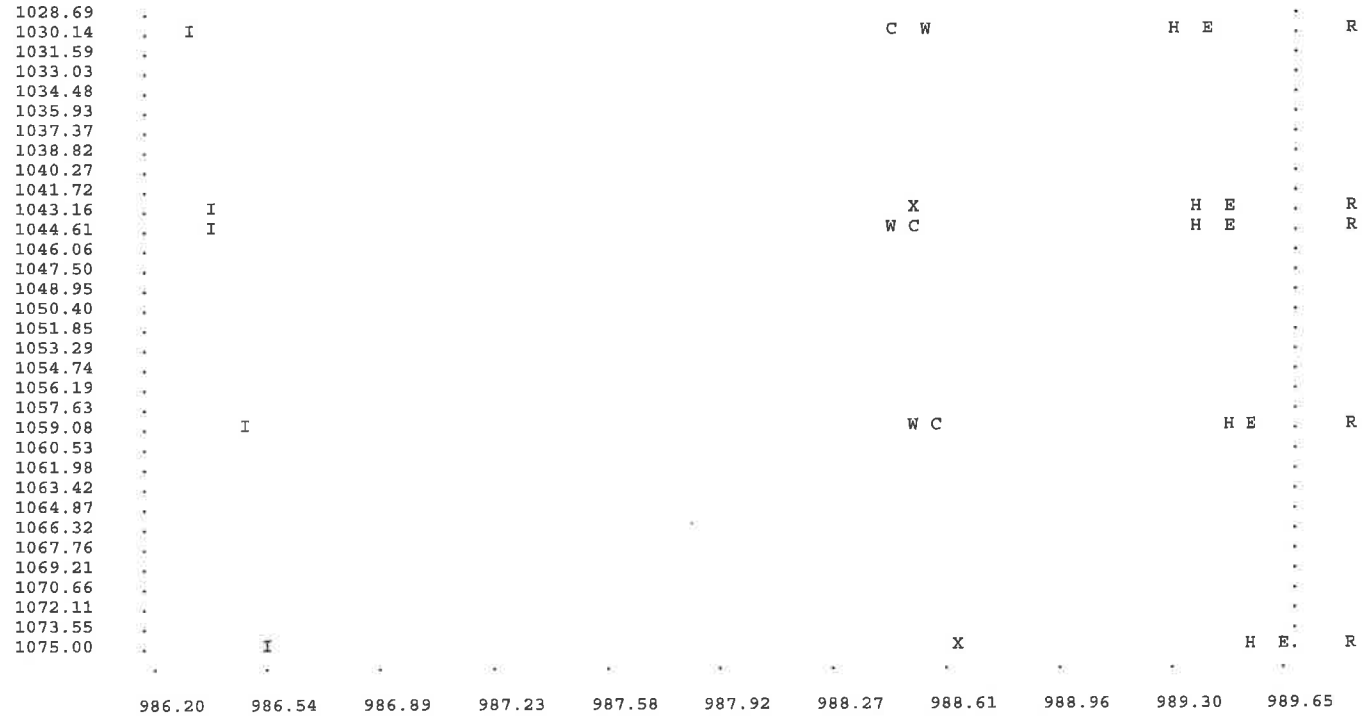
F0515P
WATER SURFACE PROFILE LISTING

TEI JOB NO 3412
SD LINE A1
100 YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1004.09	986.20	2.330	988.530	42.1	7.15	0.793	989.323	0.00	2.114		3.00	0.00	0.00	0	0.00
25.32	0.00508					.003987	0.10			2.062			0.00		
1029.41	986.33	2.223	988.552	42.1	7.50	0.872	989.424	0.00	2.114		3.00	0.00	0.00	0	0.00
13.15	0.00508					.004448	0.06			2.062			0.00		
1042.56	986.40	2.125	988.521	42.1	7.86	0.960	989.481	0.00	2.114		3.00	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00		
1042.56	986.40	2.062	988.458	42.1	8.13	1.026	989.484	0.00	2.114		3.00	0.00	0.00	0	0.00
15.71	0.00508					.005083	0.08			2.062			0.00		
1058.27	986.48	2.062	988.537	42.1	8.13	1.026	989.563	0.00	2.114		3.00	0.00	0.00	0	0.00
16.73	0.00508					.004922	0.08			2.062			0.00		
1075.00	986.56	2.114	988.674	42.1	7.91	0.971	989.645	0.00	2.114		3.00	0.00	0.00	0	0.00

TEI JOB NO 3412
SD LINE A1
100 YEAR

```
                                                  C   W          H E          R
1004.09  .I
1005.54  .
1006.98  .
1008.43  .
1009.88  .
1011.33  .
1012.77  .
1014.22  .
1015.67  .
1017.11  .
1018.56  .
1020.01  .
1021.46  .
1022.90  .
1024.35  .
1025.80  .
1027.24  .
```



N O T E S

1. GLOSSARY
   - I = INVERT ELEVATION
   - C = CRITICAL DEPTH
   - W = WATER SURFACE ELEVATION
   - H = HEIGHT OF CHANNEL
   - E = ENERGY GRADE LINE
   - X = CURVES CROSSING OVER
   - B = BRIDGE ENTRANCE OR EXIT
   - Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY□

DATE: 3/23/2017
TIME: 11:36

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	30	4			2.50														
CD	24	4			2.00														

F 0 5 1 5 P PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

TEI JOB NO 3412

HEADING LINE NO 2 IS -

SD LINE A2

HEADING LINE NO 3 IS -

100 YEAR

F 0 5 1 5 P PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1000.00	989.10	24	993.11

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1002.11	989.12	24	0.012	0.00	0.00	0.00	0

ELEMENT NO 3 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1045.13	989.22	24	0.012	22.50	33.00	0.00	0

ELEMENT NO 4 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1275.21	991.30	24	0.012	0.00	0.00	0.00	0

ELEMENT NO 5 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1279.21	991.40	24	0.012	0.00	0.00	0.00	1

ELEMENT NO 6 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1594.24	993.94	24	0.012	0.00	0.00	0.00	0

ELEMENT NO 7 IS A SYSTEM HEADWORKS * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1594.24	993.94	24	0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC
LICENSEE: THIENES ENGINEERING F0515P PAGE 1

WATER SURFACE PROFILE LISTING

TEI JOB NO 3412
SD LINE A2
100 YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
1000.00	989.10	4.010	993.110	8.4	2.67	0.111	993.221	0.00	1.033	2.00	0.00	0.00	0	0.00
2.11	0.00948					.001175	0.00		0.820			0.00		
1002.11	989.12	3.992	993.112	8.4	2.67	0.111	993.223	0.00	1.033	2.00	0.00	0.00	0	0.00
43.02	0.00232					.001175	0.05		1.243			0.00		
1045.13	989.22	3.956	993.176	8.4	2.67	0.111	993.287	0.00	1.033	2.00	0.00	0.00	0	0.00
230.08	0.00904					.001175	0.27		0.830			0.00		
1275.21	991.30	2.147	993.447	8.4	2.67	0.111	993.558	0.00	1.033	2.00	0.00	0.00	0	0.00
4.00	0.02500					.001175	0.00		0.630			0.00		
1279.21	991.40	2.057	993.457	8.4	2.67	0.111	993.568	0.00	1.033	2.00	0.00	0.00	0	0.00
8.28	0.00806					.001164	0.01		0.860			0.00		
1287.49	991.47	2.000	993.467	8.4	2.67	0.111	993.578	0.00	1.033	2.00	0.00	0.00	0	0.00
24.92	0.00806					.001090	0.03		0.860			0.00		
1312.41	991.67	1.814	993.482	8.4	2.80	0.122	993.604	0.00	1.033	2.00	0.00	0.00	0	0.00
13.69	0.00806					.001063	0.01		0.860			0.00		

1326.10	991.78	1.706	993.484	8.4	2.94	0.134	993.618	0.00	1.033		2.00	0.00	0.00	0	0.00
10.78	0.00806					.001151	0.01			0.860			0.00		
1336.88	991.87	1.618	993.483	8.4	3.08	0.148	993.631	0.00	1.033		2.00	0.00	0.00	0	0.00
9.31	0.00806					.001267	0.01			0.860			0.00		
1346.19	991.94	1.540	993.480	8.4	3.24	0.163	993.643	0.00	1.033		2.00	0.00	0.00	0	0.00
8.07	0.00806					.001406	0.01			0.860			0.00		
1354.26	992.00	1.470	993.475	8.4	3.39	0.179	993.654	0.00	1.033		2.00	0.00	0.00	0	0.00
7.10	0.00806					.001569	0.01			0.860			0.00		

WATER SURFACE PROFILE LISTING

TEI JOB NO 3412
SD LINE A2
100 YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1361.36	992.06	1.406	993.468	8.4	3.56	0.197	993.665	0.00	1.033		2.00	0.00	0.00	0	0.00
6.40	0.00806					.001757	0.01			0.860			0.00		
1367.76	992.11	1.346	993.460	8.4	3.73	0.216	993.676	0.00	1.033		2.00	0.00	0.00	0	0.00
5.48	0.00806					.001975	0.01			0.860			0.00		
1373.24	992.16	1.291	993.449	8.4	3.91	0.238	993.687	0.00	1.033		2.00	0.00	0.00	0	0.00
4.83	0.00806					.002224	0.01			0.860			0.00		
1378.07	992.20	1.239	993.436	8.4	4.11	0.262	993.698	0.00	1.033		2.00	0.00	0.00	0	0.00
0.71	0.00806					.002511	0.00			0.860			0.00		
1378.78	992.20	1.191	993.394	8.4	4.31	0.288	993.682	0.00	1.033		2.00	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00		
1378.78	992.20	0.860	993.063	8.4	6.50	0.656	993.719	0.00	1.033		2.00	0.00	0.00	0	0.00
141.94	0.00806					.007961	1.13			0.860			0.00		
1520.72	993.35	0.860	994.207	8.4	6.50	0.656	994.863	0.00	1.033		2.00	0.00	0.00	0	0.00
48.64	0.00806					.007501	0.36			0.860			0.00		
1569.36	993.74	0.889	994.628	8.4	6.22	0.600	995.228	0.00	1.033		2.00	0.00	0.00	0	0.00
14.24	0.00806					.006619	0.09			0.860			0.00		
1583.60	993.85	0.923	994.777	8.4	5.93	0.546	995.323	0.00	1.033		2.00	0.00	0.00	0	0.00
6.96	0.00806					.005822	0.04			0.860			0.00		
1590.56	993.91	0.957	994.867	8.4	5.65	0.496	995.363	0.00	1.033		2.00	0.00	0.00	0	0.00
3.09	0.00806					.005121	0.02			0.860			0.00		
1593.65	993.93	0.993	994.928	8.4	5.39	0.451	995.379	0.00	1.033		2.00	0.00	0.00	0	0.00
0.59	0.00806					.004503	0.00			0.860			0.00		

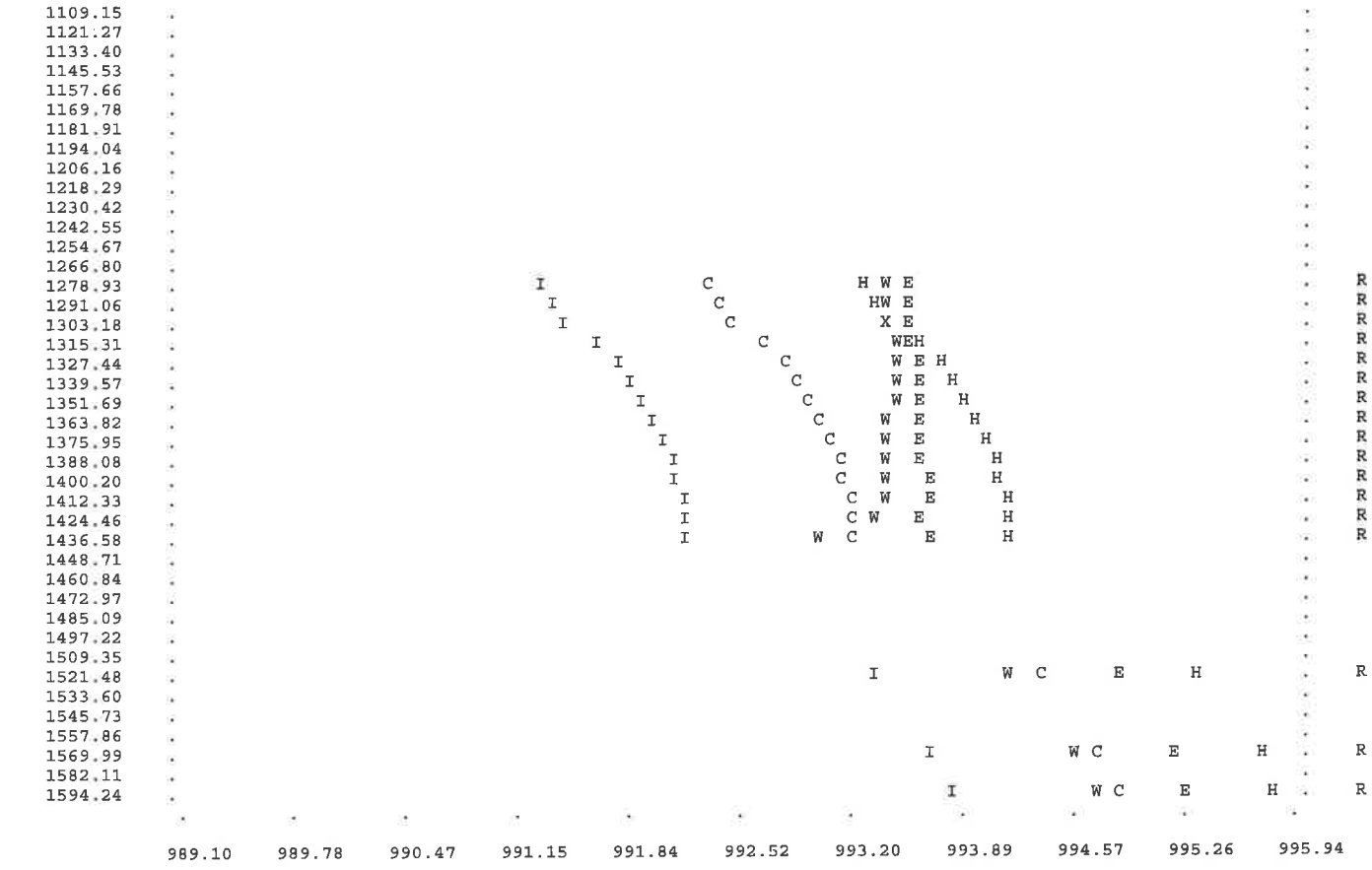
WATER SURFACE PROFILE LISTING

TEI JOB NO 3412
SD LINE A2
100 YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1594.24	993.94	1.033	994.973	8.4	5.13	0.409	995.382	0.00	1.033		2.00	0.00	0.00	0	0.00

TEI JOB NO 3412
SD LINE A2
100 YEAR

```
1000.00    .I            C          H                    W E                          .    R
1012.13    .I            C          H                    W E                          .    R
1024.25    .                                                                          .
1036.38    .                                                                          .
1048.51    . I             C          H                    W E                          .    R
1060.64    .                                                                          .
1072.76    .                                                                          .
1084.89    .                                                                          .
1097.02    .                                                                          .
```



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2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY□

APPENDIX D

DETENTION CALCULATIONS

GATEWAY SOUTH BUILDING 4
PONDING IN INFILTRAITON BASIN SWC

Elevation	Depth (feet)	Area (sq. ft.)	Volume (c.f.)	Σ Volume (c.f.)	Σ Volume (ac-ft)	Qdischarge (cfs) 30"
984.00	0.00	56956				
			58768	58768	1.35	0.0
985.00	1.00	60579				
			62432	121199	2.78	0.0
986.00	2.00	64284				
			66168	187367	4.30	0
987.00	3.00	68052				
			13686.60	201053.60	4.62	0.00
987.20	3.20	68814				
			56282.4	257336	5.91	6.30
988.00	4.00	71892				
			73847	331183	7.60	16.00
989.00	5.00	75802				
			77793	408976	9.39	30.0
990.00	6.00	79784				
			81809	490785	11.27	45.0
991.00	7.00	83834				

Gateway South Bldg 4
Basin SWC outlet control

INLET CONTROL
NOMOGRAPH FOR MITERED CIRCULAR INLET FOR 2:1 SLOPE

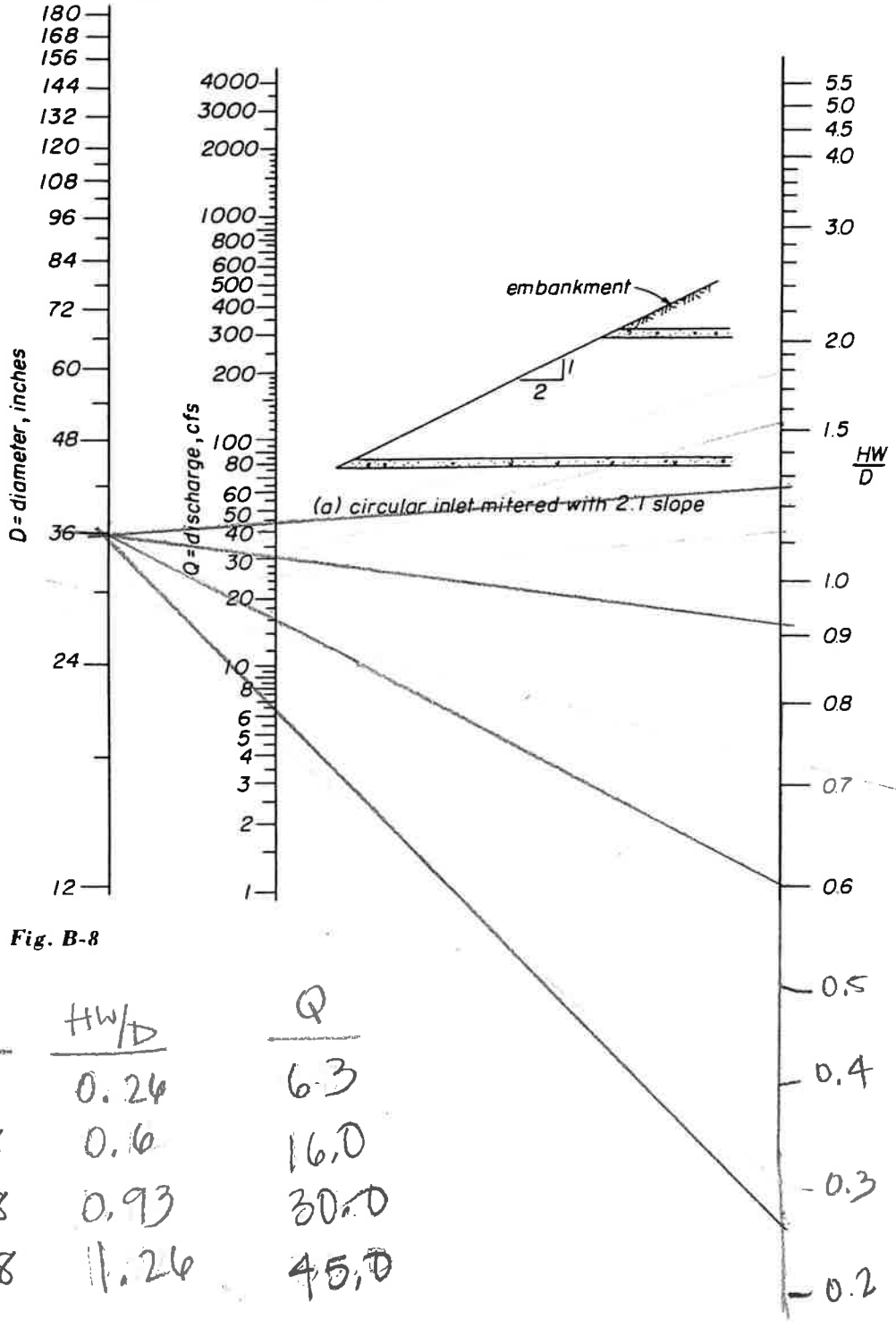

Fig. B-8

HW	HW/D	Q
0.8	0.24	6.3
1.8	0.6	16.0
2.8	0.93	30.0
3.8	1.26	45.0

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

          F L O O D    R O U T I N G    A N A L Y S I S
        USING COUNTY HYDROLOGY MANUAL OF SAN BERNARDINO(1986)
       (c) Copyright 1989-99 Advanced Engineering Software (aes)
           Ver. 7.0  Release Date: 01/01/99  License ID 1435

                        Analysis prepared by:

                          THIENES ENGINEERING
                        16800 VALLEY VIEW AVENUE
                           LA MIRADA CA 90638
                   PH: (714) 521-4811 FAX: (714) 521-4173

 ************************** DESCRIPTION OF STUDY **************************
* TEI JOB NO 3412                                                        *
* PROPOSED CONDITION                                                     *
* BASIN SWC                                                              *
 **************************************************************************

  FILE NAME: C:\XDRIVE\3412\BASINA.DAT
  TIME/DATE OF STUDY: 10:27 03/23/2017


**************************************************************************
  FLOW PROCESS FROM NODE   127.00 TO NODE   127.00 IS CODE =   1
--------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
==========================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =      60.900 ACRES
         BASEFLOW =    0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =     0.230 HOURS
          CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
          THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
          MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
         VALLEY(DEVELOPED) S-GRAPH SELECTED
         MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) =  0.074
         LOW LOSS FRACTION = 0.127
         *HYDROGRAPH MODEL #1 SPECIFIED*

         SPECIFIED PEAK  5-MINUTES RAINFALL(INCH)=  0.46
         SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)=  0.95
         SPECIFIED PEAK  1-HOUR RAINFALL(INCH) =  1.25
         SPECIFIED PEAK  3-HOUR RAINFALL(INCH) =  1.90
         SPECIFIED PEAK  6-HOUR RAINFALL(INCH) =  2.50
         SPECIFIED PEAK 24-HOUR RAINFALL(INCH) =  5.00

         PRECIPITATION DEPTH-AREA REDUCTION FACTORS:
           5-MINUTE FACTOR = 0.997
          30-MINUTE FACTOR = 0.997
           1-HOUR FACTOR = 0.997
           3-HOUR FACTOR = 1.000
           6-HOUR FACTOR = 1.000
          24-HOUR FACTOR = 1.000

         UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES
         UNIT INTERVAL PERCENTAGE OF LAG-TIME =  36.232


--------------------------------------------------------------------------
                      UNIT HYDROGRAPH DETERMINATION

--------------------------------------------------------------------------
    INTERVAL          "S" GRAPH          UNIT HYDROGRAPH
     NUMBER          MEAN VALUES          ORDINATES(CFS)
--------------------------------------------------------------------------
       1                2.466                18.162
       2               16.085               100.309
       3               41.283               185.580
       4               69.788               209.946
       5               86.806               125.336
       6               94.520                56.816
       7               97.754                23.821
       8               98.689                 6.884
       9               99.338                 4.780
      10               99.735                 2.927
      11               99.934                 1.463
      12              100.000                 0.488


--------------------------------------------------------------------------
    TOTAL SOIL-LOSS VOLUME(ACRE-FEET) =        2.7869
    TOTAL STORM RUNOFF VOLUME(ACRE FEET) =      22.5733
--------------------------------------------------------------------------

==========================================================================

                    2 4 - H O U R    S T O R M
                 R U N O F F    H Y D R O G R A P H

==========================================================================
            HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
       (Note: Time indicated is at END of Each Unit Intervals)
```

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	50.0	100.0	150.0	200.0
0.083	0.0009	0.14	Q	.	.	.	.
0.167	0.0071	0.90	Q	.	.	.	.
0.250	0.0230	2.31	Q	.	.	.	.
0.333	0.0499	3.91	Q	.	.	.	.
0.417	0.0834	4.87	Q	.	.	.	.
0.500	0.1200	5.31	VQ	.	.	.	.
0.583	0.1579	5.50	VQ	.	.	.	.
0.667	0.1963	5.57	VQ	.	.	.	.
0.750	0.2350	5.62	VQ	.	.	.	.
0.833	0.2740	5.66	VQ	.	.	.	.
0.917	0.3131	5.69	VQ	.	.	.	.
1.000	0.3524	5.71	VQ	.	.	.	.
1.083	0.3918	5.72	VQ	.	.	.	.
1.167	0.4313	5.74	VQ	.	.	.	.
1.250	0.4710	5.75	VQ	.	.	.	.
1.333	0.5107	5.77	VQ	.	.	.	.
1.417	0.5505	5.78	VQ	.	.	.	.
1.500	0.5905	5.80	.Q	.	.	.	.
1.583	0.6305	5.82	.Q	.	.	.	.
1.667	0.6707	5.83	.Q	.	.	.	.
1.750	0.7110	5.85	.Q	.	.	.	.
1.833	0.7514	5.87	.Q	.	.	.	.
1.917	0.7919	5.88	.Q	.	.	.	.
2.000	0.8326	5.90	.Q	.	.	.	.
2.083	0.8733	5.92	.Q	.	.	.	.
2.167	0.9142	5.94	.Q	.	.	.	.
2.250	0.9552	5.95	.Q	.	.	.	.
2.333	0.9963	5.97	.Q	.	.	.	.
2.417	1.0376	5.99	.Q	.	.	.	.
2.500	1.0789	6.01	.Q	.	.	.	.
2.583	1.1204	6.03	.Q	.	.	.	.
2.667	1.1621	6.04	.QV	.	.	.	.
2.750	1.2038	6.06	.QV	.	.	.	.
2.833	1.2457	6.08	.QV	.	.	.	.
2.917	1.2877	6.10	.QV	.	.	.	.
3.000	1.3298	6.12	.QV	.	.	.	.
3.083	1.3721	6.14	.QV	.	.	.	.
3.167	1.4145	6.16	.QV	.	.	.	.
3.250	1.4571	6.18	.QV	.	.	.	.
3.333	1.4997	6.20	.QV	.	.	.	.
3.417	1.5426	6.22	.QV	.	.	.	.
3.500	1.5855	6.24	.QV	.	.	.	.
3.583	1.6286	6.26	.QV	.	.	.	.
3.667	1.6718	6.28	.QV	.	.	.	.
3.750	1.7152	6.30	.Q V	.	.	.	.
3.833	1.7587	6.32	.Q V	.	.	.	.

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	50.0	100.0	150.0	200.0
3.917	1.8024	6.34	.Q V	.	.	.	.
4.000	1.8462	6.36	.Q V	.	.	.	.
4.083	1.8902	6.38	.Q V	.	.	.	.
4.167	1.9343	6.41	.Q V	.	.	.	.
4.250	1.9786	6.43	.Q V	.	.	.	.
4.333	2.0230	6.45	.Q V	.	.	.	.
4.417	2.0676	6.47	.Q V	.	.	.	.
4.500	2.1123	6.50	.Q V	.	.	.	.
4.583	2.1572	6.52	.Q V	.	.	.	.
4.667	2.2023	6.54	.Q V	.	.	.	.
4.750	2.2475	6.57	.Q V	.	.	.	.
4.833	2.2929	6.59	.Q V	.	.	.	.
4.917	2.3384	6.61	.Q V	.	.	.	.
5.000	2.3841	6.64	.Q V	.	.	.	.
5.083	2.4300	6.66	.Q V	.	.	.	.
5.167	2.4760	6.69	.Q V	.	.	.	.
5.250	2.5223	6.71	.Q V	.	.	.	.
5.333	2.5687	6.74	.Q V	.	.	.	.
5.417	2.6153	6.76	.Q V	.	.	.	.
5.500	2.6620	6.79	.Q V	.	.	.	.
5.583	2.7090	6.82	.Q V	.	.	.	.
5.667	2.7561	6.84	.Q V	.	.	.	.
5.750	2.8034	6.87	.Q V	.	.	.	.
5.833	2.8509	6.90	.Q V	.	.	.	.
5.917	2.8986	6.92	.Q V	.	.	.	.
6.000	2.9464	6.95	.Q V	.	.	.	.
6.083	2.9945	6.98	.Q V	.	.	.	.
6.167	3.0428	7.01	.Q V	.	.	.	.
6.250	3.0913	7.04	.Q V	.	.	.	.
6.333	3.1399	7.07	.Q V	.	.	.	.
6.417	3.1888	7.10	.Q V	.	.	.	.
6.500	3.2379	7.13	.Q V	.	.	.	.
6.583	3.2872	7.16	.Q V	.	.	.	.
6.667	3.3367	7.19	.Q V	.	.	.	.
6.750	3.3864	7.22	.Q V	.	.	.	.
6.833	3.4363	7.25	.Q V	.	.	.	.
6.917	3.4865	7.28	.Q V	.	.	.	.
7.000	3.5369	7.32	.Q V	.	.	.	.
7.083	3.5875	7.35	.Q V	.	.	.	.
7.167	3.6383	7.38	.Q V	.	.	.	.
7.250	3.6894	7.42	.Q V	.	.	.	.
7.333	3.7407	7.45	.Q V	.	.	.	.
7.417	3.7923	7.48	.Q V	.	.	.	.
7.500	3.8440	7.52	.Q V	.	.	.	.
7.583	3.8961	7.56	.Q V	.	.	.	.
7.667	3.9484	7.59	.Q V	.	.	.	.

7.750	4.0009	7.63	.Q	V	.	.	.	.
7.833	4.0537	7.67	.Q	V	.	.	.	.
7.917	4.1068	7.70	.Q	V	.	.	.	.
8.000	4.1601	7.74	.Q	V	.	.	.	.

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	50.0	100.0	150.0	200.0
8.083	4.2137	7.78	.Q	V	.	.	.	.
8.167	4.2676	7.82	.Q	V	.	.	.	.
8.250	4.3217	7.86	.Q	V	.	.	.	.
8.333	4.3761	7.90	.Q	V	.	.	.	.
8.417	4.4309	7.94	.Q	V	.	.	.	.
8.500	4.4859	7.99	.Q	V	.	.	.	.
8.583	4.5412	8.03	.Q	V	.	.	.	.
8.667	4.5968	8.07	.Q	V	.	.	.	.
8.750	4.6527	8.12	.Q	V	.	.	.	.
8.833	4.7089	8.16	.Q	V	.	.	.	.
8.917	4.7654	8.21	.Q	V	.	.	.	.
9.000	4.8223	8.26	.Q	V	.	.	.	.
9.083	4.8795	8.30	.Q	V	.	.	.	.
9.167	4.9370	8.35	.Q	V	.	.	.	.
9.250	4.9948	8.40	.Q	V	.	.	.	.
9.333	5.0530	8.45	.Q	V	.	.	.	.
9.417	5.1116	8.50	.Q	V	.	.	.	.
9.500	5.1705	8.55	.Q	V	.	.	.	.
9.583	5.2298	8.61	.Q	V	.	.	.	.
9.667	5.2894	8.66	.Q	V	.	.	.	.
9.750	5.3494	8.71	.Q	V	.	.	.	.
9.833	5.4098	8.77	.Q	V	.	.	.	.
9.917	5.4706	8.83	.Q	V	.	.	.	.
10.000	5.5318	8.89	.Q	V	.	.	.	.
10.083	5.5934	8.94	.Q	V	.	.	.	.
10.167	5.6554	9.01	.Q	V	.	.	.	.
10.250	5.7179	9.07	.Q	V	.	.	.	.
10.333	5.7808	9.13	.Q	V	.	.	.	.
10.417	5.8441	9.19	.Q	V	.	.	.	.
10.500	5.9079	9.26	.Q	V	.	.	.	.
10.583	5.9721	9.33	.Q	V	.	.	.	.
10.667	6.0368	9.40	.Q	V	.	.	.	.
10.750	6.1020	9.47	.Q	V	.	.	.	.
10.833	6.1677	9.54	.Q	V	.	.	.	.
10.917	6.2339	9.61	.Q	.V	.	.	.	.
11.000	6.3006	9.69	.Q	.V	.	.	.	.
11.083	6.3678	9.76	.Q	.V	.	.	.	.
11.167	6.4356	9.84	.Q	.V	.	.	.	.
11.250	6.5039	9.92	.Q	.V	.	.	.	.
11.333	6.5729	10.01	. Q	.V	.	.	.	.
11.417	6.6423	10.09	. Q	.V	.	.	.	.
11.500	6.7124	10.18	. Q	.V	.	.	.	.
11.583	6.7831	10.27	. Q	. V	.	.	.	.
11.667	6.8545	10.36	. Q	. V	.	.	.	.
11.750	6.9265	10.45	. Q	. V	.	.	.	.
11.833	6.9991	10.55	. Q	. V	.	.	.	.
11.917	7.0725	10.65	. Q	. V	.	.	.	.
12.000	7.1465	10.75	. Q	. V	.	.	.	.
12.083	7.2209	10.80	. Q	. V	.	.	.	.
12.167	7.2938	10.59	. Q	. V	.	.	.	.

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	50.0	100.0	150.0	200.0
12.250	7.3635	10.12	. Q	. V	.	.	.	.
12.333	7.4294	9.57	.Q	. V	.	.	.	.
12.417	7.4934	9.29	.Q	. V	.	.	.	.
12.500	7.5570	9.23	.Q	. V	.	.	.	.
12.583	7.6210	9.28	.Q	. V	.	.	.	.
12.667	7.6856	9.39	.Q	. V	.	.	.	.
12.750	7.7511	9.50	.Q	. V	.	.	.	.
12.833	7.8174	9.63	.Q	. V	.	.	.	.
12.917	7.8847	9.77	.Q	. V	.	.	.	.
13.000	7.9530	9.92	.Q	. V	.	.	.	.
13.083	8.0223	10.07	. Q	. V	.	.	.	.
13.167	8.0927	10.23	. Q	. V	.	.	.	.
13.250	8.1643	10.40	. Q	. V	.	.	.	.
13.333	8.2372	10.57	. Q	. V	.	.	.	.
13.417	8.3112	10.75	. Q	. V	.	.	.	.
13.500	8.3866	10.95	. Q	. V	.	.	.	.
13.583	8.4634	11.15	. Q	. V	.	.	.	.
13.667	8.5416	11.36	. Q	. V	.	.	.	.
13.750	8.6214	11.58	. Q	. V	.	.	.	.
13.833	8.7028	11.82	. Q	. V	.	.	.	.
13.917	8.7859	12.06	. Q	. V	.	.	.	.
14.000	8.8708	12.33	. Q	. V	.	.	.	.
14.083	8.9575	12.59	. Q	. V	.	.	.	.
14.167	9.0458	12.83	. Q	. V	.	.	.	.
14.250	9.1355	13.03	. Q	. V	.	.	.	.
14.333	9.2267	13.24	. Q	. V	.	.	.	.
14.417	9.3198	13.51	. Q	. V	.	.	.	.
14.500	9.4153	13.87	. Q	. V	.	.	.	.
14.583	9.5135	14.26	. Q	. V	.	.	.	.
14.667	9.6147	14.70	. Q	. V	.	.	.	.
14.750	9.7192	15.18	. Q	. V	.	.	.	.
14.833	9.8274	15.71	. Q	. V	.	.	.	.
14.917	9.9396	16.28	. Q	. V	.	.	.	.
15.000	10.0561	16.93	. Q	. V	.	.	.	.
15.083	10.1775	17.63	. Q	. V	.	.	.	.
15.167	10.3045	18.43	. Q	. V	.	.	.	.
15.250	10.4375	19.32	. Q	. V	.	.	.	.

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	50.0	100.0	150.0	200.0
15.333	10.5776	20.35	. Q .		V .	.	.
15.417	10.7259	21.54	. Q .		V.	.	.
15.500	10.8847	23.05	. Q .		V.	.	.
15.583	11.0562	24.91	. Q .		V.	.	.
15.667	11.2438	27.23	. Q .		V.	.	.
15.750	11.4508	30.06	. Q .		V	.	.
15.833	11.6849	33.99	. Q .		V	.	.
15.917	11.9576	39.59	. Q .		.V	.	.
16.000	12.2932	48.74	. Q.		.V	.	.
16.083	12.7630	68.21	. Q		. V	.	.
16.167	13.5125	108.82	.		.Q V	.	.
16.250	14.4910	142.08	.		. V Q	.	.
16.333	15.4728	142.56	.		. VQ	.	.

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	50.0	100.0	150.0	200.0
16.417	16.1628	100.18	.		Q	V .	.
16.500	16.6004	63.55	.	Q	.	V.	.
16.583	16.8922	42.37	. Q	.	.	V.	.
16.667	17.0998	30.14	. Q	.	.	V	.
16.750	17.2734	25.21	. Q	.	.	V	.
16.833	17.4228	21.69	. Q	.	.	V	.
16.917	17.5539	19.03	. Q	.	.	.V	.
17.000	17.6713	17.05	. Q	.	.	.V	.
17.083	17.7788	15.61	. Q	.	.	.V	.
17.167	17.8796	14.63	. Q	.	.	.V	.
17.250	17.9752	13.88	. Q	.	.	.V	.
17.333	18.0666	13.27	. Q	.	.	. V	.
17.417	18.1541	12.71	. Q	.	.	. V	.
17.500	18.2380	12.18	. Q	.	.	. V	.
17.583	18.3185	11.69	. Q	.	.	. V	.
17.667	18.3960	11.25	. Q	.	.	. V	.
17.750	18.4707	10.85	. Q	.	.	. V	.
17.833	18.5429	10.48	. Q	.	.	. V	.
17.917	18.6128	10.14	. Q	.	.	. V	.
18.000	18.6805	9.84	.Q	.	.	. V	.
18.083	18.7467	9.61	.Q	.	.	. V	.
18.167	18.8132	9.66	.Q	.	.	. V	.
18.250	18.8820	9.99	.Q	.	.	. V	.
18.333	18.9538	10.42	. Q	.	.	. V	.
18.417	19.0267	10.59	. Q	.	.	. V	.
18.500	19.0995	10.56	. Q	.	.	. V	.
18.583	19.1714	10.44	. Q	.	.	. V	.
18.667	19.2421	10.27	. Q	.	.	. V	.
18.750	19.3118	10.11	. Q	.	.	. V	.
18.833	19.3803	9.95	.Q	.	.	. V	.
18.917	19.4477	9.79	.Q	.	.	. V	.
19.000	19.5141	9.64	.Q	.	.	. V	.
19.083	19.5795	9.49	.Q	.	.	. V	.
19.167	19.6439	9.35	.Q	.	.	. V	.
19.250	19.7074	9.22	.Q	.	.	. V	.
19.333	19.7700	9.09	.Q	.	.	. V	.
19.417	19.8318	8.97	.Q	.	.	. V	.
19.500	19.8928	8.85	.Q	.	.	. V	.
19.583	19.9529	8.74	.Q	.	.	. V	.
19.667	20.0123	8.63	.Q	.	.	. V	.
19.750	20.0710	8.52	.Q	.	.	. V	.
19.833	20.1290	8.42	.Q	.	.	. V	.
19.917	20.1863	8.32	.Q	.	.	. V	.
20.000	20.2430	8.23	.Q	.	.	. V	.
20.083	20.2990	8.13	.Q	.	.	. V	.
20.167	20.3544	8.05	.Q	.	.	. V	.
20.250	20.4092	7.96	.Q	.	.	. V	.
20.333	20.4635	7.88	.Q	.	.	. V	.
20.417	20.5172	7.80	.Q	.	.	. V	.
20.500	20.5703	7.72	.Q	.	.	. V	.

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	50.0	100.0	150.0	200.0
20.583	20.6230	7.64	.Q	.	.	. V	.
20.667	20.6751	7.57	.Q	.	.	. V	.
20.750	20.7267	7.50	.Q	.	.	. V	.
20.833	20.7779	7.43	.Q	.	.	. V	.
20.917	20.8286	7.36	.Q	.	.	. V	.
21.000	20.8788	7.29	.Q	.	.	. V	.
21.083	20.9286	7.23	.Q	.	.	. V	.
21.167	20.9780	7.17	.Q	.	.	. V	.
21.250	21.0269	7.11	.Q	.	.	. V	.
21.333	21.0755	7.05	.Q	.	.	. V	.
21.417	21.1236	6.99	.Q	.	.	. V	.
21.500	21.1714	6.93	.Q	.	.	. V	.
21.583	21.2187	6.88	.Q	.	.	. V	.
21.667	21.2657	6.82	.Q	.	.	. V	.
21.750	21.3124	6.77	.Q	.	.	. V	.
21.833	21.3587	6.72	.Q	.	.	. V	.
21.917	21.4046	6.67	.Q	.	.	. V	.
22.000	21.4502	6.62	.Q	.	.	. V	.
22.083	21.4955	6.57	.Q	.	.	. V	.
22.167	21.5404	6.53	.Q	.	.	. V	.
22.250	21.5850	6.48	.Q	.	.	. V	.
22.333	21.6294	6.44	.Q	.	.	. V	.
22.417	21.6734	6.39	.Q	.	.	. V	.
22.500	21.7171	6.35	.Q	.	.	. V	.
22.583	21.7605	6.31	.Q	.	.	. V	.
22.667	21.8037	6.26	.Q	.	.	. V	.
22.750	21.8465	6.22	.Q	.	.	. V	.
22.833	21.8891	6.18	.Q	.	.	. V	.

22.917	21.9314	6.14	.Q	.	.	.	V	.
23.000	21.9735	6.11	.Q	.	.	.	V	.
23.083	22.0153	6.07	.Q	.	.	.	V.	
23.167	22.0568	6.03	.Q	.	.	.	V.	
23.250	22.0981	5.99	.Q	.	.	.	V.	
23.333	22.1391	5.96	.Q	.	.	.	V.	
23.417	22.1799	5.92	.Q	.	.	.	V.	
23.500	22.2205	5.89	.Q	.	.	.	V.	
23.583	22.2608	5.86	.Q	.	.	.	V.	
23.667	22.3009	5.82	.Q	.	.	.	V.	
23.750	22.3408	5.79	.Q	.	.	.	V.	
23.833	22.3805	5.76	.Q	.	.	.	V.	
23.917	22.4199	5.73	.Q	.	.	.	V.	
24.000	22.4591	5.69	.Q	.	.	.	V.	
24.083	22.4972	5.53	.Q	.	.	.	V.	
24.167	22.5298	4.74	Q	.	.	.	V.	
24.250	22.5526	3.31	Q	.	.	.	V.	
24.333	22.5643	1.70	Q	.	.	.	V.	
24.417	22.5694	0.74	Q	.	.	.	V.	
24.500	22.5715	0.31	Q	.	.	.	V.	
24.583	22.5724	0.13	Q	.	.	.	V.	
24.667	22.5729	0.07	Q	.	.	.	V.	

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	50.0	100.0	150.0	200.0
24.750	22.5732	0.04	Q	.	.	.	V.
24.833	22.5733	0.01	Q	.	.	.	V.
24.917	22.5733	0.00	Q	.	.	.	V

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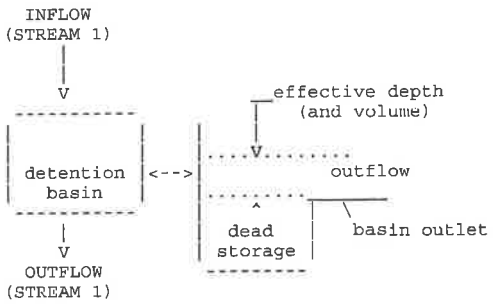
FLOW PROCESS FROM NODE 127.00 TO NODE 127.00 IS CODE = 3.1

>>>>>FLOW-THROUGH DETENTION BASIN ROUTING MODEL APPLIED TO STREAM #1<<<<<



ROUTE RUNOFF HYDROGRAPH FROM STREAM NUMBER 1
THROUGH A FLOW-THROUGH DETENTION BASIN
SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
DEAD STORAGE(AF) = 0.000
SPECIFIED DEAD STORAGE(AF) FILLED = 0.000
SPECIFIED EFFECTIVE VOLUME(AF) FILLED ABOVE OUTLET = 0.000
DETENTION BASIN CONSTANT LOSS RATE(CFS) = 0.00

BASIN DEPTH VERSUS OUTFLOW AND STORAGE INFORMATION:

INTERVAL NUMBER	DEPTH (FT)	OUTFLOW (CFS)	STORAGE (AF)
1	0.00	0.00	0.000
2	1.00	0.01	1.350
3	2.00	0.02	2.780
4	3.00	0.03	4.300
5	3.20	0.44	4.620
6	4.00	6.30	5.910
7	5.00	16.00	7.600
8	6.00	30.00	9.390
9	7.00	45.00	11.270

MODIFIED-PULS BASIN ROUTING MODEL RESULTS(5-MINUTE COMPUTATION INTERVALS):
(Note: Computed EFFECTIVE DEPTH and VOLUME are estimated at the clock time;
MEAN OUTFLOW is the average value during the unit interval.)

CLOCK TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	LOSS (CFS)	EFFECTIVE DEPTH(FT)	MEAN OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
12.083	0.000	10.80	0.00	4.09	7.1	6.060
12.167	0.000	10.59	0.00	4.10	7.2	6.083
12.250	0.000	10.12	0.00	4.11	7.3	6.102
12.333	0.000	9.57	0.00	4.12	7.4	6.117
12.417	0.000	9.29	0.00	4.13	7.5	6.129
12.500	0.000	9.23	0.00	4.14	7.6	6.140
12.583	0.000	9.28	0.00	4.14	7.7	6.152
12.667	0.000	9.39	0.00	4.15	7.7	6.163
12.750	0.000	9.50	0.00	4.16	7.8	6.175

12.833	0.000	9.63	0.00	4.16	7.9	6.187
12.917	0.000	9.77	0.00	4.17	7.9	6.200
13.000	0.000	9.92	0.00	4.18	8.0	6.213
13.083	0.000	10.07	0.00	4.19	8.1	6.227
13.167	0.000	10.23	0.00	4.20	8.2	6.241
13.250	0.000	10.40	0.00	4.20	8.2	6.256
13.333	0.000	10.57	0.00	4.21	8.3	6.271
13.417	0.000	10.75	0.00	4.22	8.4	6.287
13.500	0.000	10.95	0.00	4.23	8.5	6.304
13.583	0.000	11.15	0.00	4.24	8.6	6.322
13.667	0.000	11.36	0.00	4.25	8.7	6.340
13.750	0.000	11.58	0.00	4.27	8.8	6.359
13.833	0.000	11.82	0.00	4.28	8.9	6.379
13.917	0.000	12.06	0.00	4.29	9.0	6.399
14.000	0.000	12.33	0.00	4.30	9.2	6.421
14.083	0.000	12.59	0.00	4.32	9.3	6.444
14.167	0.000	12.83	0.00	4.33	9.4	6.467
14.250	0.000	13.03	0.00	4.34	9.6	6.491
14.333	0.000	13.24	0.00	4.36	9.7	6.515
14.417	0.000	13.51	0.00	4.37	9.8	6.541
14.500	0.000	13.87	0.00	4.39	10.0	6.567
14.583	0.000	14.26	0.00	4.41	10.2	6.595
14.667	0.000	14.70	0.00	4.42	10.3	6.626
14.750	0.000	15.18	0.00	4.44	10.5	6.658
14.833	0.000	15.71	0.00	4.46	10.7	6.692
14.917	0.000	16.28	0.00	4.48	10.9	6.730
15.000	0.000	16.93	0.00	4.51	11.1	6.770
15.083	0.000	17.63	0.00	4.53	11.4	6.813
15.167	0.000	18.43	0.00	4.56	11.6	6.860
15.250	0.000	19.32	0.00	4.59	11.9	6.911
15.333	0.000	20.35	0.00	4.63	12.2	6.967
15.417	0.000	21.54	0.00	4.66	12.5	7.029
15.500	0.000	23.05	0.00	4.70	12.9	7.098
15.583	0.000	24.91	0.00	4.75	13.3	7.178
15.667	0.000	27.23	0.00	4.80	13.8	7.270
15.750	0.000	30.06	0.00	4.87	14.4	7.378
15.833	0.000	33.99	0.00	4.95	15.1	7.508
15.917	0.000	39.59	0.00	5.04	16.0	7.671
16.000	0.000	48.74	0.00	5.16	17.4	7.886
16.083	0.000	68.21	0.00	5.35	19.6	8.222
16.167	0.000	108.82	0.00	5.68	23.2	8.811

MODIFIED-PULS BASIN ROUTING MODEL RESULTS(5-MINUTE COMPUTATION INTERVALS):
(Note: Computed EFFECTIVE DEPTH and VOLUME are estimated at the clock time;
MEAN OUTFLOW is the average value during the unit interval.)

CLOCK TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	LOSS (CFS)	EFFECTIVE DEPTH(FT)	MEAN OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
16.250	0.000	142.08	0.00	6.11	28.5	9.593
16.333	0.000	142.56	0.00	6.50	34.6	10.337
16.417	0.000	100.18	0.00	6.73	39.2	10.757
16.500	0.000	63.55	0.00	6.81	41.5	10.908
16.583	0.000	42.37	0.00	6.81	42.1	10.910
16.667	0.000	30.14	0.00	6.77	41.8	10.830
16.750	0.000	25.21	0.00	6.71	41.1	10.721
16.833	0.000	21.69	0.00	6.64	40.1	10.594
16.917	0.000	19.03	0.00	6.57	39.1	10.456
17.000	0.000	17.05	0.00	6.49	37.9	10.312
17.083	0.000	15.61	0.00	6.41	36.8	10.166
17.167	0.000	14.63	0.00	6.34	35.6	10.022
17.250	0.000	13.88	0.00	6.26	34.5	9.880
17.333	0.000	13.27	0.00	6.19	33.4	9.742
17.417	0.000	12.71	0.00	6.12	32.3	9.607
17.500	0.000	12.18	0.00	6.05	31.2	9.476
17.583	0.000	11.69	0.00	5.98	30.2	9.349
17.667	0.000	11.25	0.00	5.91	29.2	9.225
17.750	0.000	10.85	0.00	5.84	28.2	9.105
17.833	0.000	10.48	0.00	5.78	27.3	8.989
17.917	0.000	10.14	0.00	5.71	26.4	8.877
18.000	0.000	9.84	0.00	5.65	25.6	8.769
18.083	0.000	9.61	0.00	5.59	24.7	8.665
18.167	0.000	9.66	0.00	5.54	23.9	8.566
18.250	0.000	9.99	0.00	5.49	23.2	8.475
18.333	0.000	10.42	0.00	5.44	22.5	8.392
18.417	0.000	10.59	0.00	5.40	21.9	8.314
18.500	0.000	10.56	0.00	5.36	21.3	8.240
18.583	0.000	10.44	0.00	5.32	20.7	8.169
18.667	0.000	10.27	0.00	5.28	20.2	8.101
18.750	0.000	10.11	0.00	5.24	19.7	8.035
18.833	0.000	9.95	0.00	5.21	19.2	7.972
18.917	0.000	9.79	0.00	5.17	18.7	7.911
19.000	0.000	9.64	0.00	5.14	18.2	7.852
19.083	0.000	9.49	0.00	5.11	17.7	7.795
19.167	0.000	9.35	0.00	5.08	17.3	7.740
19.250	0.000	9.22	0.00	5.05	16.9	7.687
19.333	0.000	9.09	0.00	5.02	16.5	7.636
19.417	0.000	8.97	0.00	4.99	16.1	7.587
19.500	0.000	8.85	0.00	4.96	15.8	7.539
19.583	0.000	8.74	0.00	4.94	15.5	7.493
19.667	0.000	8.63	0.00	4.91	15.3	7.447
19.750	0.000	8.52	0.00	4.88	15.0	7.403
19.833	0.000	8.42	0.00	4.86	14.7	7.359
19.917	0.000	8.32	0.00	4.83	14.5	7.316

PEAK DISCHARGE

PROCESS SUMMARY OF STORAGE:
INFLOW VOLUME = 22.573 AF

```
    BASIN  STORAGE =      2.594 AF (WITH      0.000 AF INITIALLY FILLED)
    OUTFLOW VOLUME =     19.979 AF
    LOSS    VOLUME =      0.000 AF
================================================================================

  END OF FLOODSCx ROUTING ANALYSIS
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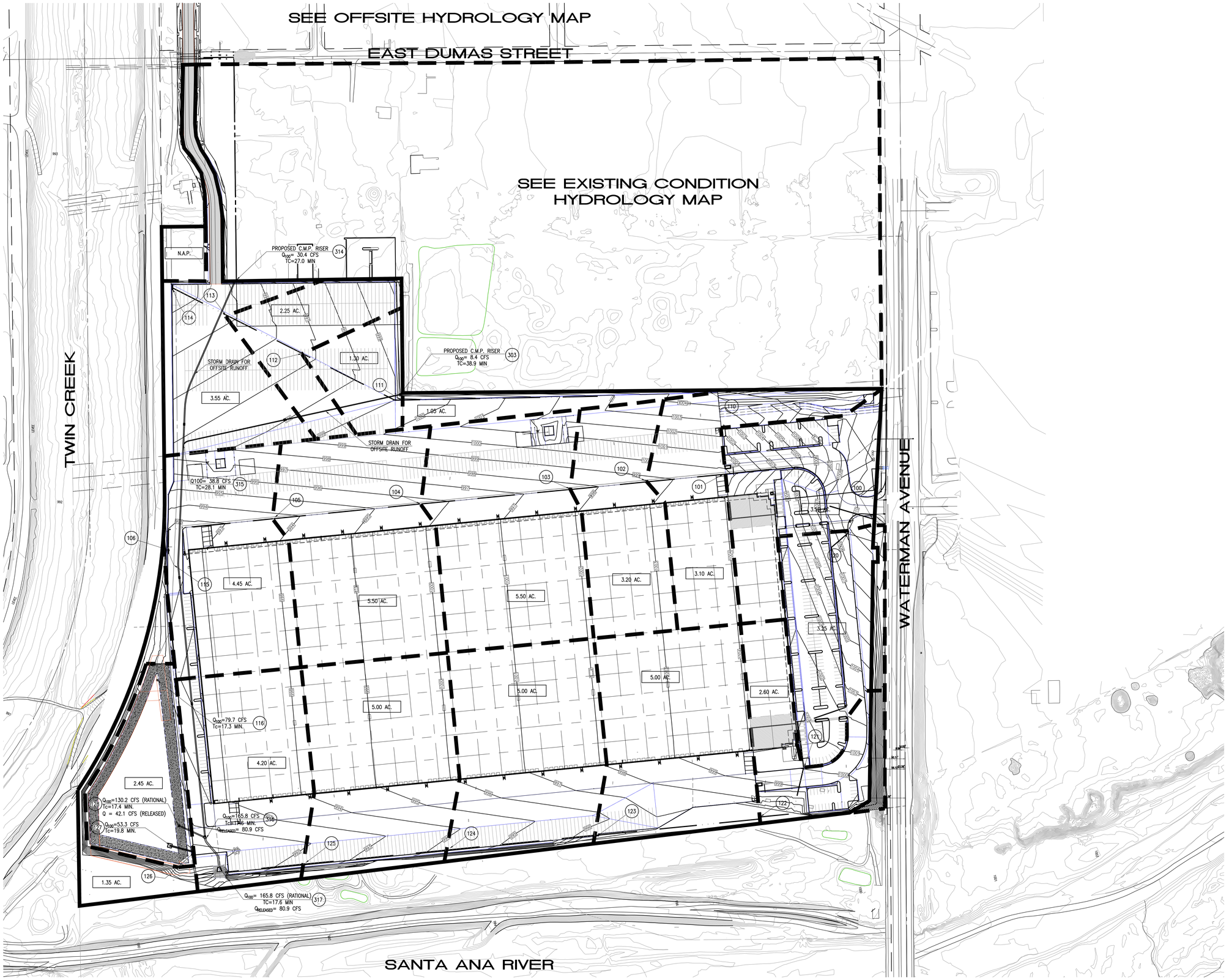
APPENDIX E

HYDROLOGY MAPS



LEGEND	
	PROJECT BOUNDARY
	SUBAREA BOUNDARY
	FLOWLINE
1.00 AC.	SUBAREA AREA
(100)	NODE NUMBER

0 50 100 200 300

SCALE:1"=100'

Last Update: 10/24/16
O:\3400-3499\3412\3412HYD.dwg

CITY OF SAN BERNARDINO
PUBLIC WORKS DEPARTMENT

PROPOSED CONDITION HYDROLOGY MAP

GATEWAY SOUTH BUILDING 4
WATERMAN AVENUE

3158/1 OF 1 SHEET

PREPARED FOR:

Hillwood Investments
901 Via Piemonte, Suite 175
Ontario, CA 91764
PHONE: (909)382-0033
FAX: (909)382-0073

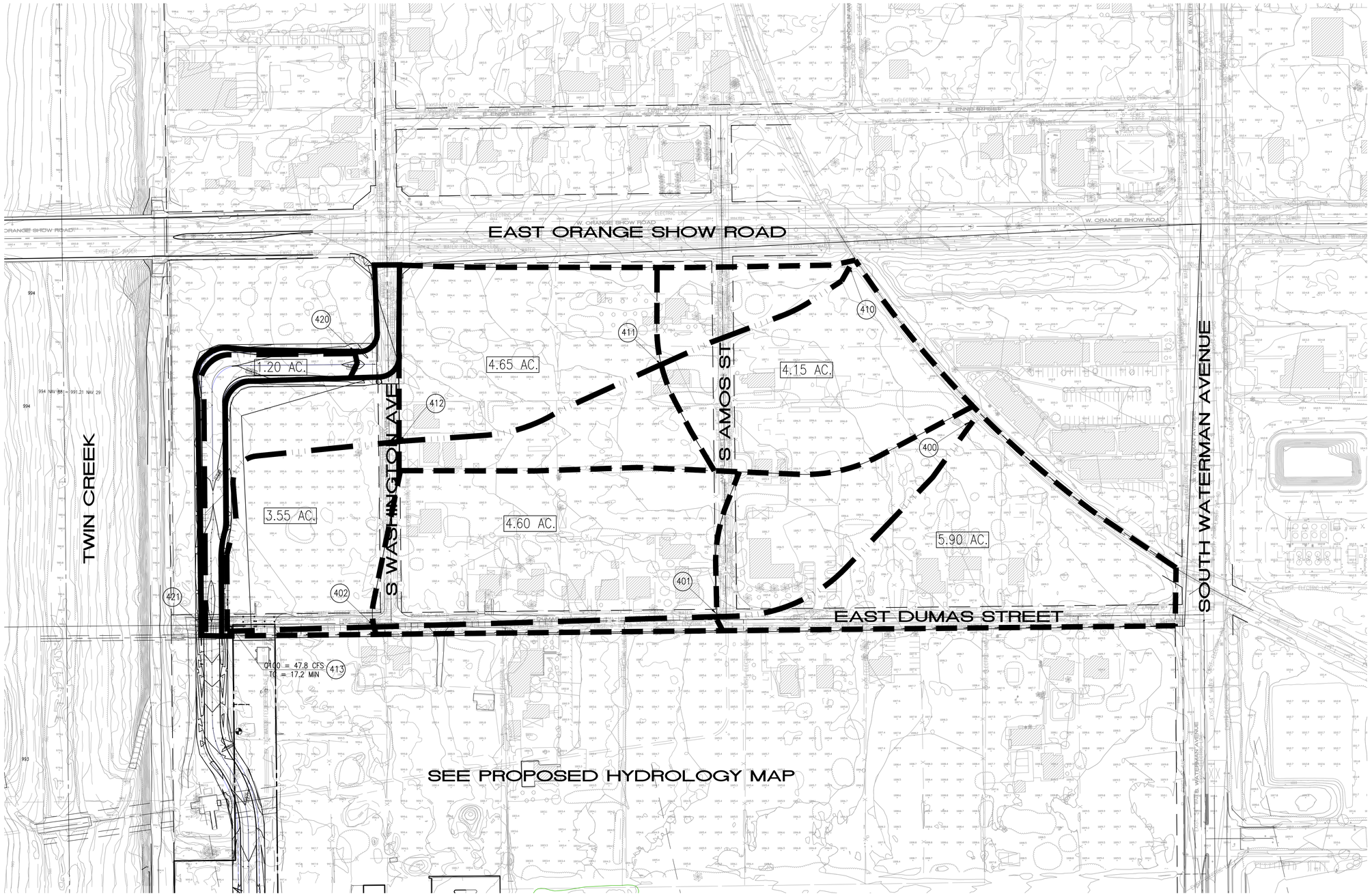
Thienes Engineering, Inc.
CIVIL ENGINEERING · LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

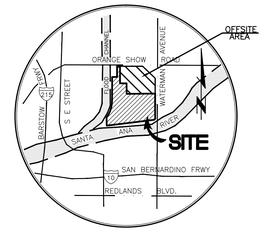
Designed by _____ Date _____
Checked by _____ Date _____
Designed by _____ Date _____
Checked by _____ Date _____

Approved by _____ Date _____

Public Works Director R.C.E. 28129

Sheet 1 of 1 Sheets





VICINITY MAP
N.T.S.

LEGEND	
	PROJECT BOUNDARY
	SUBAREA BOUNDARY
	FLOWLINE
1.00 AC.	SUBAREA AREA
(100)	NODE NUMBER

0 40 80 160 240
SCALE:1"=80'

Last Update:12/23/15
O:\3400-3499\3412\3412HYD-EX.dwg

CITY OF SAN BERNARDINO
PUBLIC WORKS DEPARTMENT

OFF SITE HYDROLOGY MAP

GATEWAY SOUTH BUILDING 5

WATERMAN AVENUE

3158/1 OF 1 SHEET

PREPARED FOR:
Hillwood Investments
901 Via Piemonte, Suite 175
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Designed by _____ Date _____
Checked by _____ Date _____
Designed by _____ Date _____
Checked by _____ Date _____

Approved by _____ Date _____
Public Works Director R.C.E. 28129

Sheet 1 of 1 Sheets