Appendix G
Hydrology Analysis

ESA

HYDROLOGY ANALYSIS

FOR

CRAWFORD CANYON PARK

S. CRAWFORD CANYON ROAD
& NEWPORT BLVD

City of Tustin

County of Orange, California

November 16, 2020

Prepared for:

OC PARKS

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PREPARED UNDER THE SUPERVISION OF:

11/16/2020

Jianhua "Gary" Guan, R.C.E. 64519, Exp. 06/30/21 Date:

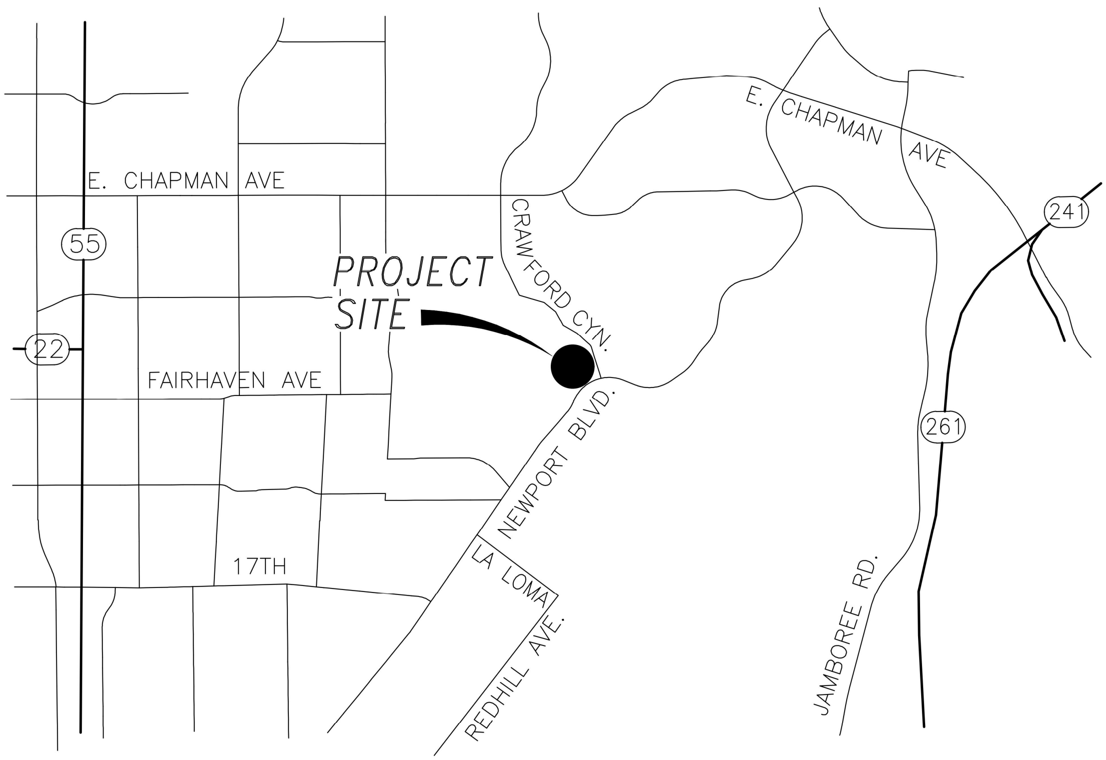
TABLE OF CONTENTS

SECTION I

INTRODUCTION

A. PROJECT LOCATION

The project site is located on the northwest corner of Newport Avenue and Crawford Canyon Road in the City of Tustin. The site is bound by Newport Avenue on the south, existing single family residences on the north and west, and Crawford Canyon Road on the east. The general location of the project site can be found blow.



LOCATION MAP

B. STUDY PURPOSE

The purpose of this preliminary hydrology study is to determine the flow rates produced by the site in its existing and proposed conditions for comparisons. It will also serve as the basis for analyzing and designing the proposed development's required storm drain system. This report has been extended to perform the off-site hydrology analysis for the existing storm drain systems within the project site.

As part of the report, the 2-year, 25- and 100-year storm events for both existing and proposed conditions were analyzed. In addition, water quality BMPs are provided to ensure all flows will be treated prior to release into the existing storm drain systems downstream.

C. DISCUSSION

Existing Condition:

The project site in the size of approximate 3.9 acre is located on the northwest corner of Newport Avenue and Crawford Canyon Road in the City of Tustin. Currently, the project site is a public park with paved areas, concrete channels, scattered trees and vegetation.

There are existing storm drain systems within the project site. The existing storm drain systems convey the offsite runoffs from the north and east existing single family residential developments.

There is an existing 30” storm drain and 36” storm drain at the northeast corner of the project for the off-site flows. There is an existing 48” pipe after the confluence of the existing 30” and 36” pipes. The 48” storm drains discharge into an existing energy dissipater and ultimately into the existing trapezoidal earthen/concrete channel. The existing trapezoidal channel joins an existing 42” RCP at the southwest corner of the project and ultimately discharges into an existing 60-inch RCP along Newport Boulevard.

Majority of runoffs within the project site, including west half of Crawford Canyon Road sheet flows from east to west into a depressed area downstream where flows are collected and conveyed into the on-site trapezoidal channel.

Existing concrete v-ditches are located along the southern boundary along Newport Blvd to collect and convey the flows within the project site and are discharged into the existing trapezoidal channel downstream via a concrete down drain.

Refer to Exhibit 1 for off-site hydrology map and Exhibit 2 for on-site hydrology map for detailed drainage facilities

Proposed Condition:

The park improvements will consist of the following:

- New asphalt-concrete parking lot
- New storm water basin
- 8-foot wide walkways
- 5-foot wide trails
- Picnic tables and benches
- Exercise station
- Pedestrian bridges
- Various play areas
- Retaining wall in order to create a level area for the new parking lot

The proposed project drainage pattern remains the same as the existing condition. The off-site hydrology studies remain the same without any changes.

An inlet is proposed for the concrete down drain at the northeastern corner of the project and will be proposed to join the existing 30-inch RCP underneath. A 16-Ft wide turf block access road will be proposed for the existing 48" pipe.

The majority of the on-site runoffs will be collected and conveyed by a meandering natural creek swale, which traverses the park site from east to west. A Bioretention basin is proposed at the end of the swale for water quality treatments. The storm runoffs from the Bioretention basin discharge to the existing trapezoidal channel.

An inlet and Filterra unit are proposed at the entrance to the parking lot. The storm drain system is proposed to join the existing trapezoidal channel which discharges into by an existing 42-inch RCP and ultimately into an existing 60-inch RCP along Newport Boulevard

Refer to Exhibit 3 for on-site hydrology map and the proposed drainage systems.

D. HYDROLOGY METHODOLOGY

The rational method was used to calculate the design discharge for the local drainage areas since the watershed area to the proposed storm drain systems is less than one square mile.

Hydrologic calculations to determine the 2-, 25- and 100-year discharges at critical locations throughout the project site were performed using the Orange County Rational Method. A technical description of the rational method is provided in the Orange County Hydrology Manual dated October, 1986. The Rational Method is an empirical computation procedure for developing a peak runoff rate (discharge) for small watersheds for storms of a specified recurrence interval. The rational method equation is based on the assumption that the peak flow rate is directly proportional to the drainage area, rainfall intensity and a loss coefficient which describes the effects of land use and soil type. The design discharges were computed by generating a hydrologic "link-node" model which divides the area into subareas, each tributary to a concentration point or hydrologic "node" point determined by the proposed terrain or street layout.

The following assumptions/guidelines were applied for use of the Rational Method.

- The rational Method Hydrology includes the effects of infiltration caused by soil surface characteristics. The soil map from Orange County Hydrology Manual indicates that the study area consists of soil types B, C & D. Refer to soils Map in Section 4. Hydrologic soils ratings are based on a scale of A through D, where A is the most pervious, providing the least runoff.

- The infiltration rate is also affected by the type of vegetation or ground cover and percentage of impervious surface. The runoff coefficients used for this study were based on the proposed land uses.
- Standard intensity-duration curve data was taken from the Orange County Hydrology Manual, dated October, 1986.

The hydrologic calculations were prepared using the Advanced Engineering Software (A.E.S.) Rational Method computer program. The results of the hydrologic calculations were used to design the required storm drain facilities.

E. HYDROLOGY STUDY RESULTS

There is only one drainage area within the studied reach for both the existing condition and proposed condition.

There are no available hydrology studies for the existing 30" and 36" pipe at the northeastern corner of the project site. This hydrology study was extended to include the off-site drainage areas. The 2-ft contour interval orthotopo mapping and aerial image was used to determine the drainage boundaries and land uses in the hydrology studies. The off-site hydrology studies (Exhibit 1) remain the same for the existing and proposed conditions.

The existing condition hydrology map and calculations can be found in Section 2 and the proposed condition hydrology analysis can be found in Section 3. Table 1 summarizes the hydrology analysis results for the overall hydrology study.

TABLE 1. CRAWFORD CANYON PARK OVERALL HYDROLOGY SUMMARY

Drainage Area	Existing Condition				Proposed Condition				Delta (Proposed-Existing)			
	Area	2-year	25-year	100-year	Area	2-year	25-year	100-year	Area (Ac)	2-year	25-year	100-year
	(acre)	(cfs)	(cfs)	(cfs)	(acre)	(cfs)	(cfs)	(cfs)	(acre)	(cfs)	(cfs)	(cfs)
Overall	37.1	35.8	86.4	113.2	37.1	35.7	86.0	112.9	0.0	-0.1	-0.4	-0.3

As indicated in the table 1, the overall peak runoffs are similar to the existing condition after the park improvements. The overall tributary areas remain the same and the proposed condition flow rate are all less than the existing levels.

F. CONCLUSION

Overall, it is concluded that there will have no adverse impacts to the existing drainage systems due to the project developments.

H. WATER QUALITY MANGEMENT PLAN REPORT

The water quality BMPs are provided for the project to meet the WQMP and LID requirements and is provided per separate report.

SECTION II
EXISTING CONDITION HYDROLOGY CALCULATIONS &MAP

A. 2-YEAR STORM

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****************************************************************************
           RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
       (c) Copyright 1983-2016 Advanced Engineering Software (aes)
           Ver. 23.0  Release Date: 07/01/2016  License ID 1239

                         Analysis prepared by:

                         HUNSAKER & ASSOCIATES
                               Irvine,Inc
                   Planning * Engineering * Surveying
         Three Hughes * Irvine, California 92618 * (949)583-1010

 ************************** DESCRIPTION OF STUDY **************************
* Hydrology Study for Crawford Park                                        *
* Existing Condition                                                       *
* 2-year Storm                                                             *
 **************************************************************************

  FILE NAME: CPEX.DAT
  TIME/DATE OF STUDY: 19:25 11/13/2020
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                  --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.  (FT)     (FT)     SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   280.00
  ELEVATION DATA: UPSTREAM(FEET) =    915.00  DOWNSTREAM(FEET) =    750.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.475
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.797
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"               C        1.19      0.25     1.000    59    7.47
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      1.66
  TOTAL AREA(ACRES) =      1.19   PEAK FLOW RATE(CFS) =      1.66

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    750.00  DOWNSTREAM(FEET) =    600.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   325.00   CHANNEL SLOPE =  0.4615
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =      1.66
  FLOW VELOCITY(FEET/SEC) =   5.24 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.03   Tc(MIN.) =    8.51
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     605.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.51
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.668
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"               C        0.90      0.25     1.000    59
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        0.24      0.20     1.000    67
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.24
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    1.14      SUBAREA RUNOFF(CFS) =    1.47
  EFFECTIVE AREA(ACRES) =      2.33   AREA-AVERAGED Fm(INCH/HR) =  0.24
  AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       2.3       PEAK FLOW RATE(CFS) =      2.98

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  600.00  DOWNSTREAM ELEVATION(FEET) =  503.00
```

```
 STREET LENGTH(FEET) =   730.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

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

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

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.11
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.25
   HALFSTREET FLOOD WIDTH(FEET) =    4.66
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    6.59
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.62
 STREET FLOW TRAVEL TIME(MIN.) =   1.85   Tc(MIN.) =   10.35
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.491
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "2 DWELLINGS/ACRE"         D        3.49      0.20     0.700    57
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
 SUBAREA AREA(ACRES) =    3.49      SUBAREA RUNOFF(CFS) =    4.24
 EFFECTIVE AREA(ACRES) =      5.82    AREA-AVERAGED Fm(INCH/HR) =  0.18
 AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  0.82
 TOTAL AREA(ACRES) =        5.8       PEAK FLOW RATE(CFS) =       6.85

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.27   HALFSTREET FLOOD WIDTH(FEET) =   5.91
 FLOW VELOCITY(FEET/SEC.) =  6.78   DEPTH*VELOCITY(FT*FT/SEC.) =   1.82
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     13.00 =    1335.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     13.00 TO NODE     14.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  503.00  DOWNSTREAM ELEVATION(FEET) =  395.00
 STREET LENGTH(FEET) =  1085.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

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

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

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       9.89
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.31
   HALFSTREET FLOOD WIDTH(FEET) =    8.09
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    6.35
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.95
 STREET FLOW TRAVEL TIME(MIN.) =   2.85   Tc(MIN.) =   13.20
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.296
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "2 DWELLINGS/ACRE"         D        5.82      0.20     0.700    57
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
 SUBAREA AREA(ACRES) =    5.82      SUBAREA RUNOFF(CFS) =    6.06
 EFFECTIVE AREA(ACRES) =     11.64    AREA-AVERAGED Fm(INCH/HR) =  0.16
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.76
 TOTAL AREA(ACRES) =       11.6       PEAK FLOW RATE(CFS) =      11.90

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =   8.91
 FLOW VELOCITY(FEET/SEC.) =  6.59   DEPTH*VELOCITY(FT*FT/SEC.) =   2.12
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     14.00 =    2420.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     14.00 TO NODE     15.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   395.00  DOWNSTREAM(FEET) =   394.00
 FLOW LENGTH(FEET) =    45.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   9.55
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      11.90
 PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =   13.28
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     15.00 =    2465.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   13.28
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.292
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "2 DWELLINGS/ACRE"         D       10.89      0.20     0.700    57
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
 SUBAREA AREA(ACRES) =   10.89      SUBAREA RUNOFF(CFS) =   11.29
 EFFECTIVE AREA(ACRES) =     22.53   AREA-AVERAGED Fm(INCH/HR) =  0.15
```

```
  AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.73
  TOTAL AREA(ACRES) =       22.5      PEAK FLOW RATE(CFS) =      23.14

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     25.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   394.00  DOWNSTREAM(FEET) =   371.00
  FLOW LENGTH(FEET) =   240.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  19.58
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      23.14
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =   13.49
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     25.00 =    2705.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     25.00 TO NODE     25.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   13.49
  RAINFALL INTENSITY(INCH/HR) =   1.28
  AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.21
  AREA-AVERAGED Ap =  0.73
  EFFECTIVE STREAM AREA(ACRES) =      22.53
  TOTAL STREAM AREA(ACRES) =      22.53
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      23.14

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   295.00
  ELEVATION DATA: UPSTREAM(FEET) =    460.00  DOWNSTREAM(FEET) =    436.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.036
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.861
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "2 DWELLINGS/ACRE"         C       1.17      0.25     0.700    50    7.04
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
  SUBAREA RUNOFF(CFS) =      1.77
  TOTAL AREA(ACRES) =      1.17   PEAK FLOW RATE(CFS) =      1.77

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  436.00  DOWNSTREAM ELEVATION(FEET) =  385.00
  STREET LENGTH(FEET) =   625.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.41
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.26
    HALFSTREET FLOOD WIDTH(FEET) =    5.47
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.23
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.36
  STREET FLOW TRAVEL TIME(MIN.) =   1.99   Tc(MIN.) =    9.03
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.613
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "2 DWELLINGS/ACRE"         C       0.65      0.25     0.700    50
  COMMERCIAL                 C       0.30      0.25     0.100    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.511
  SUBAREA AREA(ACRES) =    0.95      SUBAREA RUNOFF(CFS) =    1.27
  EFFECTIVE AREA(ACRES) =      2.12    AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.62
  TOTAL AREA(ACRES) =       2.1       PEAK FLOW RATE(CFS) =      2.78

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.27   HALFSTREET FLOOD WIDTH(FEET) =   6.03
  FLOW VELOCITY(FEET/SEC.) =  5.37   DEPTH*VELOCITY(FT*FT/SEC.) =   1.45
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =     920.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     22.00 TO NODE     25.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   385.00  DOWNSTREAM(FEET) =   371.00
  FLOW LENGTH(FEET) =   225.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.48
```

```
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       2.78
 PIPE TRAVEL TIME(MIN.) =   0.40    Tc(MIN.) =    9.42
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     25.00 =    1145.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     25.00 TO NODE     25.00 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.) =    9.42
 RAINFALL INTENSITY(INCH/HR) =   1.57
 AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.62
 EFFECTIVE STREAM AREA(ACRES) =       2.12
 TOTAL STREAM AREA(ACRES) =       2.12
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.78

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       23.14   13.49    1.281  0.21( 0.15) 0.73      22.5      10.00
     2        2.78    9.42    1.573  0.25( 0.15) 0.62       2.1      20.00

 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       23.14    9.42    1.573  0.21( 0.15) 0.72      17.9      20.00
     2       25.35   13.49    1.281  0.21( 0.15) 0.72      24.6      10.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      25.35    Tc(MIN.) =    13.49
 EFFECTIVE AREA(ACRES) =      24.65   AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.72
 TOTAL AREA(ACRES) =       24.6
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     25.00 =    2705.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     25.00 TO NODE     26.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   371.00  DOWNSTREAM(FEET) =   367.00
 FLOW LENGTH(FEET) =   110.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  13.77
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      25.35
 PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =   13.62
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     26.00 =    2815.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     26.00 TO NODE     26.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   13.62
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.274
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       B        0.33      0.30     0.600    36
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       C        3.00      0.25     0.600    50
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA AREA(ACRES) =     3.33      SUBAREA RUNOFF(CFS) =    3.36
 EFFECTIVE AREA(ACRES) =     27.98   AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.71
 TOTAL AREA(ACRES) =       28.0       PEAK FLOW RATE(CFS) =      28.26

****************************************************************************
 FLOW PROCESS FROM NODE     26.00 TO NODE     27.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   367.00  DOWNSTREAM(FEET) =   347.00
 FLOW LENGTH(FEET) =   480.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  14.82
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      28.26
 PIPE TRAVEL TIME(MIN.) =   0.54    Tc(MIN.) =   14.16
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     27.00 =    3295.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     27.00 TO NODE     27.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   14.16
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.245
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       B        2.00      0.30     0.600    36
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       C        0.50      0.25     0.600    50
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       D        2.16      0.20     0.600    57
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
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 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA AREA(ACRES) =    4.66      SUBAREA RUNOFF(CFS) =    4.60
 EFFECTIVE AREA(ACRES) =     32.64   AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  0.69
 TOTAL AREA(ACRES) =       32.6      PEAK FLOW RATE(CFS) =      32.15

****************************************************************************
 FLOW PROCESS FROM NODE     27.00 TO NODE     35.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    347.00  DOWNSTREAM(FEET) =    345.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =    70.00   CHANNEL SLOPE =  0.0286
 CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   5.00
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.238
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                B        0.13      0.30     0.850    36
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      32.21
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   8.13
 AVERAGE FLOW DEPTH(FEET) =   0.37   TRAVEL TIME(MIN.) =   0.14
 Tc(MIN.) =   14.30
 SUBAREA AREA(ACRES) =     0.13       SUBAREA RUNOFF(CFS) =    0.12
 EFFECTIVE AREA(ACRES) =     32.77     AREA-AVERAGED Fm(INCH/HR) =   0.15
 AREA-AVERAGED Fp(INCH/HR) =   0.22  AREA-AVERAGED Ap =   0.69
 TOTAL AREA(ACRES) =       32.8        PEAK FLOW RATE(CFS) =      32.15
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.37   FLOW VELOCITY(FEET/SEC.) =   8.11
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     35.00 =    3365.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     35.00 TO NODE     35.00 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.) =   14.30
 RAINFALL INTENSITY(INCH/HR) =   1.24
 AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.22
 AREA-AVERAGED Ap =  0.69
 EFFECTIVE STREAM AREA(ACRES) =      32.77
 TOTAL STREAM AREA(ACRES) =      32.77
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      32.15

****************************************************************************
 FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   250.00
 ELEVATION DATA: UPSTREAM(FEET) =    393.00  DOWNSTREAM(FEET) =    372.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
 SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                 D        0.10      0.20     0.100    57    5.00
 PUBLIC PARK                C        0.30      0.25     0.850    50    7.22
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.663
 SUBAREA RUNOFF(CFS) =      0.76
 TOTAL AREA(ACRES) =       0.40   PEAK FLOW RATE(CFS) =      0.76

****************************************************************************
 FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    372.00  DOWNSTREAM(FEET) =    361.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   335.00   CHANNEL SLOPE =  0.0328
 CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   5.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.790
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                B        1.33      0.30     0.850    36
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.69
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.21
 AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =   2.53
 Tc(MIN.) =    7.53
 SUBAREA AREA(ACRES) =     1.33       SUBAREA RUNOFF(CFS) =    1.84
 EFFECTIVE AREA(ACRES) =      1.73     AREA-AVERAGED Fm(INCH/HR) =   0.23
 AREA-AVERAGED Fp(INCH/HR) =   0.29  AREA-AVERAGED Ap =   0.81
 TOTAL AREA(ACRES) =        1.7        PEAK FLOW RATE(CFS) =       2.42

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.16   FLOW VELOCITY(FEET/SEC.) =   2.52
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =     585.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     32.00 TO NODE     33.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    361.00  DOWNSTREAM(FEET) =    350.00
```

```
CHANNEL LENGTH THRU SUBAREA(FEET) =   263.00   CHANNEL SLOPE =  0.0418
CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   5.000
MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
*   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.617
SUBAREA LOSS RATE DATA(AMC  I ):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
PUBLIC PARK                B       1.27      0.30     0.850    36
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.20
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.01
AVERAGE FLOW DEPTH(FEET) =   0.18   TRAVEL TIME(MIN.) =   1.46
Tc(MIN.) =    8.98
SUBAREA AREA(ACRES) =     1.27       SUBAREA RUNOFF(CFS) =    1.56
EFFECTIVE AREA(ACRES) =      3.00     AREA-AVERAGED Fm(INCH/HR) =   0.24
AREA-AVERAGED Fp(INCH/HR) =   0.29  AREA-AVERAGED Ap =   0.82
TOTAL AREA(ACRES) =        3.0         PEAK FLOW RATE(CFS) =       3.71

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.20   FLOW VELOCITY(FEET/SEC.) =   3.07
LONGEST FLOWPATH FROM NODE     30.00 TO NODE     33.00 =     848.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     33.00 TO NODE     35.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   350.00  DOWNSTREAM(FEET) =   345.00
FLOW LENGTH(FEET) =    80.00   MANNING'S N =  0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =  10.32
ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =       3.71
PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    9.11
LONGEST FLOWPATH FROM NODE     30.00 TO NODE     35.00 =     928.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     35.00 TO NODE     35.00 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.) =    9.11
RAINFALL INTENSITY(INCH/HR) =   1.60
AREA-AVERAGED Fm(INCH/HR) =  0.24
AREA-AVERAGED Fp(INCH/HR) =  0.29
AREA-AVERAGED Ap =  0.82
EFFECTIVE STREAM AREA(ACRES) =       3.00
TOTAL STREAM AREA(ACRES) =       3.00
PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.71
```

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	31.66	10.25	1.500	0.22(0.15)	0.68	26.0	20.00
1	32.15	14.30	1.238	0.22(0.15)	0.69	32.8	10.00
2	3.71	9.11	1.604	0.29(0.24)	0.82	3.0	30.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	34.05	9.11	1.604	0.23(0.16)	0.70	26.1	30.00
2	35.09	10.25	1.500	0.23(0.16)	0.70	29.0	20.00
3	34.87	14.30	1.238	0.23(0.16)	0.70	35.8	10.00

```
COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      35.09    Tc(MIN.) =    10.25
EFFECTIVE AREA(ACRES) =      28.98   AREA-AVERAGED Fm(INCH/HR) =  0.16
AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap =  0.70
TOTAL AREA(ACRES) =       35.8
LONGEST FLOWPATH FROM NODE     10.00 TO NODE     35.00 =    3365.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     35.00 TO NODE     45.00 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    345.00  DOWNSTREAM(FEET) =    339.00
CHANNEL LENGTH THRU SUBAREA(FEET) =   275.00   CHANNEL SLOPE =  0.0218
CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   5.00
*   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.452
SUBAREA LOSS RATE DATA(AMC  I ):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
PUBLIC PARK                B       0.58      0.30     0.850    36
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      35.40
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   7.73
AVERAGE FLOW DEPTH(FEET) =   0.42   TRAVEL TIME(MIN.) =   0.59
Tc(MIN.) =   10.84
SUBAREA AREA(ACRES) =     0.58       SUBAREA RUNOFF(CFS) =    0.62
EFFECTIVE AREA(ACRES) =     29.56     AREA-AVERAGED Fm(INCH/HR) =   0.16
AREA-AVERAGED Fp(INCH/HR) =   0.23  AREA-AVERAGED Ap =   0.70
TOTAL AREA(ACRES) =       36.4         PEAK FLOW RATE(CFS) =      35.09
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.42   FLOW VELOCITY(FEET/SEC.) =   7.77
LONGEST FLOWPATH FROM NODE     10.00 TO NODE     45.00 =    3640.00 FEET.

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

```
  FLOW PROCESS FROM NODE     45.00 TO NODE     45.00 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.) =   10.84
  RAINFALL INTENSITY(INCH/HR) =   1.45
  AREA-AVERAGED Fm(INCH/HR) =  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.23
  AREA-AVERAGED Ap =  0.70
  EFFECTIVE STREAM AREA(ACRES) =      29.56
  TOTAL STREAM AREA(ACRES) =      36.35
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      35.09

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     41.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   160.00
  ELEVATION DATA: UPSTREAM(FEET) =    388.20  DOWNSTREAM(FEET) =    378.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.378
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.968
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  PUBLIC PARK                B       0.20      0.30     0.850    36    6.38
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA RUNOFF(CFS) =      0.31
  TOTAL AREA(ACRES) =      0.20   PEAK FLOW RATE(CFS) =      0.31

****************************************************************************
  FLOW PROCESS FROM NODE     41.00 TO NODE     42.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    378.00  DOWNSTREAM(FEET) =    364.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   260.00   CHANNEL SLOPE =  0.0538
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.688
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                B       0.23      0.30     0.850    36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      0.46
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.21
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =   1.96
  Tc(MIN.) =    8.33
  SUBAREA AREA(ACRES) =     0.23       SUBAREA RUNOFF(CFS) =    0.30
  EFFECTIVE AREA(ACRES) =      0.43     AREA-AVERAGED Fm(INCH/HR) =  0.26
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.85
  TOTAL AREA(ACRES) =       0.4        PEAK FLOW RATE(CFS) =      0.55

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.10   FLOW VELOCITY(FEET/SEC.) =   2.42
  LONGEST FLOWPATH FROM NODE     40.00 TO NODE     42.00 =     420.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     42.00 TO NODE     43.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    364.00  DOWNSTREAM(FEET) =    354.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   275.00   CHANNEL SLOPE =  0.0364
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.488
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                B       0.23      0.30     0.850    36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      0.68
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.24
  AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =   2.05
  Tc(MIN.) =   10.38
  SUBAREA AREA(ACRES) =     0.23       SUBAREA RUNOFF(CFS) =    0.26
  EFFECTIVE AREA(ACRES) =      0.66     AREA-AVERAGED Fm(INCH/HR) =  0.26
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.85
  TOTAL AREA(ACRES) =       0.7        PEAK FLOW RATE(CFS) =      0.73

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.14   FLOW VELOCITY(FEET/SEC.) =   2.29
  LONGEST FLOWPATH FROM NODE     40.00 TO NODE     43.00 =     695.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     43.00 TO NODE     44.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    354.00  DOWNSTREAM(FEET) =    345.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   260.00   CHANNEL SLOPE =  0.0346
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.354
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                B       0.12      0.30     0.850    36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
```

```
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.79
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.33
 AVERAGE FLOW DEPTH(FEET) =   0.15   TRAVEL TIME(MIN.) =   1.86
 Tc(MIN.) =   12.24
 SUBAREA AREA(ACRES) =     0.12       SUBAREA RUNOFF(CFS) =    0.12
 EFFECTIVE AREA(ACRES) =      0.78     AREA-AVERAGED Fm(INCH/HR) =   0.25
 AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.85
 TOTAL AREA(ACRES) =        0.8         PEAK FLOW RATE(CFS) =       0.77

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.15   FLOW VELOCITY(FEET/SEC.) =   2.27
 LONGEST FLOWPATH FROM NODE     40.00 TO NODE     44.00 =     955.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     44.00 TO NODE     45.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    345.00  DOWNSTREAM(FEET) =    339.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =    40.00   CHANNEL SLOPE =  0.1500
 CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   5.00
 CHANNEL FLOW THRU SUBAREA(CFS) =       0.77
 FLOW VELOCITY(FEET/SEC.) =   2.98   FLOW DEPTH(FEET) =   0.03
 TRAVEL TIME(MIN.) =   0.22   Tc(MIN.) =   12.46
 LONGEST FLOWPATH FROM NODE     40.00 TO NODE     45.00 =     995.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     45.00 TO NODE     45.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =   12.46
 RAINFALL INTENSITY(INCH/HR) =   1.34
 AREA-AVERAGED Fm(INCH/HR) =  0.25
 AREA-AVERAGED Fp(INCH/HR) =  0.30
 AREA-AVERAGED Ap =  0.85
 EFFECTIVE STREAM AREA(ACRES) =       0.78
 TOTAL STREAM AREA(ACRES) =       0.78
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.77

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       34.05    9.71    1.547  0.23( 0.16) 0.70      26.7      30.00
     1       35.09   10.84    1.452  0.23( 0.16) 0.70      29.6      20.00
     1       34.87   14.90    1.210  0.23( 0.16) 0.71      36.4      10.00
     2        0.77   12.46    1.340  0.30( 0.25) 0.85       0.8      40.00

 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       34.77    9.71    1.547  0.24( 0.17) 0.70      27.3      30.00
     2       35.83   10.84    1.452  0.23( 0.16) 0.70      30.2      20.00
     3       35.77   12.46    1.340  0.23( 0.16) 0.71      33.1      40.00
     4       35.54   14.90    1.210  0.23( 0.16) 0.71      37.1      10.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      35.83    Tc(MIN.) =     10.84
 EFFECTIVE AREA(ACRES) =      30.24   AREA-AVERAGED Fm(INCH/HR) =  0.16
 AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap =  0.70
 TOTAL AREA(ACRES) =       37.1
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     45.00 =    3640.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =       37.1  TC(MIN.) =     10.84
 EFFECTIVE AREA(ACRES) =     30.24  AREA-AVERAGED Fm(INCH/HR)=  0.16
 AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap = 0.703
 PEAK FLOW RATE(CFS)    =      35.83

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       34.77    9.71    1.547  0.24( 0.17) 0.70      27.3      30.00
     2       35.83   10.84    1.452  0.23( 0.16) 0.70      30.2      20.00
     3       35.77   12.46    1.340  0.23( 0.16) 0.71      33.1      40.00
     4       35.54   14.90    1.210  0.23( 0.16) 0.71      37.1      10.00
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

B. 25-YEAR STORM

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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 ************************* DESCRIPTION OF STUDY **************************
* Hydrology Study for Crawford Park                                        *
* Existing Condition                                                       *
* 25-year Storm                                                            *
 **************************************************************************

  FILE NAME: CPEX.DAT
  TIME/DATE OF STUDY: 19:26 11/13/2020
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN- / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)    (FT)     SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   280.00
  ELEVATION DATA: UPSTREAM(FEET) =    915.00  DOWNSTREAM(FEET) =    750.00
```

```
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.475
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.842
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"               C        1.19      0.25     1.000    77    7.47
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      3.85
  TOTAL AREA(ACRES) =      1.19   PEAK FLOW RATE(CFS) =      3.85

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    750.00  DOWNSTREAM(FEET) =    600.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   325.00   CHANNEL SLOPE =  0.4615
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =      3.85
  FLOW VELOCITY(FEET/SEC) =   6.28 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.86   Tc(MIN.) =    8.34
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     605.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.34
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.612
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"               C        0.90      0.25     1.000    77
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        0.24      0.20     1.000    83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.24
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    1.14      SUBAREA RUNOFF(CFS) =    3.46
  EFFECTIVE AREA(ACRES) =      2.33   AREA-AVERAGED Fm(INCH/HR) =  0.24
  AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       2.3       PEAK FLOW RATE(CFS) =      7.06

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  600.00  DOWNSTREAM ELEVATION(FEET) =  503.00
```

```
 STREET LENGTH(FEET) =   730.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

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

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

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      11.97
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.31
   HALFSTREET FLOOD WIDTH(FEET) =    8.28
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    7.42
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    2.30
 STREET FLOW TRAVEL TIME(MIN.) =   1.64   Tc(MIN.) =    9.98
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.263
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "2 DWELLINGS/ACRE"         D        3.49      0.20     0.700    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
 SUBAREA AREA(ACRES) =    3.49      SUBAREA RUNOFF(CFS) =    9.81
 EFFECTIVE AREA(ACRES) =      5.82    AREA-AVERAGED Fm(INCH/HR) =  0.18
 AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  0.82
 TOTAL AREA(ACRES) =        5.8       PEAK FLOW RATE(CFS) =      16.14

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =   9.66
 FLOW VELOCITY(FEET/SEC.) =  7.86   DEPTH*VELOCITY(FT*FT/SEC.) =   2.63
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     13.00 =    1335.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     13.00 TO NODE     14.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  503.00  DOWNSTREAM ELEVATION(FEET) =  395.00
 STREET LENGTH(FEET) =  1085.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

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

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

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      23.36
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.38
   HALFSTREET FLOOD WIDTH(FEET) =   12.23
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    7.64
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    2.91
 STREET FLOW TRAVEL TIME(MIN.) =   2.37   Tc(MIN.) =   12.34
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.892
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "2 DWELLINGS/ACRE"         D        5.82      0.20     0.700    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
 SUBAREA AREA(ACRES) =    5.82      SUBAREA RUNOFF(CFS) =   14.42
 EFFECTIVE AREA(ACRES) =     11.64    AREA-AVERAGED Fm(INCH/HR) =  0.16
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.76
 TOTAL AREA(ACRES) =       11.6       PEAK FLOW RATE(CFS) =      28.61

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.40   HALFSTREET FLOOD WIDTH(FEET) =  13.40
 FLOW VELOCITY(FEET/SEC.) =  7.96   DEPTH*VELOCITY(FT*FT/SEC.) =   3.20
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     14.00 =    2420.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     14.00 TO NODE     15.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   395.00  DOWNSTREAM(FEET) =   394.00
 FLOW LENGTH(FEET) =    45.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  11.79
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      28.61
 PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =   12.41
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     15.00 =    2465.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   12.41
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.884
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "2 DWELLINGS/ACRE"         D       10.89      0.20     0.700    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
 SUBAREA AREA(ACRES) =   10.89      SUBAREA RUNOFF(CFS) =   26.89
 EFFECTIVE AREA(ACRES) =     22.53   AREA-AVERAGED Fm(INCH/HR) =  0.15
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 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.73
 TOTAL AREA(ACRES) =      22.5      PEAK FLOW RATE(CFS) =      55.42

****************************************************************************
 FLOW PROCESS FROM NODE     15.00 TO NODE     25.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   394.00  DOWNSTREAM(FEET) =   371.00
 FLOW LENGTH(FEET) =   240.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  16.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  24.20
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      55.42
 PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =   12.57
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     25.00 =    2705.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     25.00 TO NODE     25.00 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.) =   12.57
 RAINFALL INTENSITY(INCH/HR) =   2.86
 AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.21
 AREA-AVERAGED Ap =  0.73
 EFFECTIVE STREAM AREA(ACRES) =      22.53
 TOTAL STREAM AREA(ACRES) =      22.53
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      55.42

****************************************************************************
 FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   295.00
 ELEVATION DATA: UPSTREAM(FEET) =    460.00  DOWNSTREAM(FEET) =    436.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.036
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.976
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 "2 DWELLINGS/ACRE"         C       1.17      0.25     0.700    69    7.04
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
 SUBAREA RUNOFF(CFS) =      4.00
 TOTAL AREA(ACRES) =      1.17   PEAK FLOW RATE(CFS) =      4.00
```

```
****************************************************************************
 FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  436.00  DOWNSTREAM ELEVATION(FEET) =  385.00
 STREET LENGTH(FEET) =   625.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

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

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

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.45
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.32
   HALFSTREET FLOOD WIDTH(FEET) =    8.97
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.97
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.93
 STREET FLOW TRAVEL TIME(MIN.) =   1.74   Tc(MIN.) =    8.78
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.507
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "2 DWELLINGS/ACRE"         C       0.65      0.25     0.700    69
 COMMERCIAL                 C       0.30      0.25     0.100    69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.511
 SUBAREA AREA(ACRES) =    0.95      SUBAREA RUNOFF(CFS) =    2.89
 EFFECTIVE AREA(ACRES) =      2.12    AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.62
 TOTAL AREA(ACRES) =       2.1       PEAK FLOW RATE(CFS) =      6.40

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =   9.72
 FLOW VELOCITY(FEET/SEC.) =  6.17   DEPTH*VELOCITY(FT*FT/SEC.) =   2.07
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =     920.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     22.00 TO NODE     25.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   385.00  DOWNSTREAM(FEET) =   371.00
 FLOW LENGTH(FEET) =   225.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.02
```

```
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       6.40
 PIPE TRAVEL TIME(MIN.) =   0.31    Tc(MIN.) =    9.09
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     25.00 =    1145.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     25.00 TO NODE     25.00 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.) =    9.09
 RAINFALL INTENSITY(INCH/HR) =   3.44
 AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.62
 EFFECTIVE STREAM AREA(ACRES) =       2.12
 TOTAL STREAM AREA(ACRES) =       2.12
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.40

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       55.42   12.57    2.862  0.21( 0.15) 0.73      22.5      10.00
     2        6.40    9.09    3.439  0.25( 0.15) 0.62       2.1      20.00

 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       54.99    9.09    3.439  0.21( 0.15) 0.72      18.4      20.00
     2       60.69   12.57    2.862  0.21( 0.15) 0.72      24.6      10.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      60.69    Tc(MIN.) =    12.57
 EFFECTIVE AREA(ACRES) =      24.65   AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.72
 TOTAL AREA(ACRES) =       24.6
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     25.00 =    2705.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     25.00 TO NODE     26.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   371.00  DOWNSTREAM(FEET) =   367.00
 FLOW LENGTH(FEET) =   110.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  30.0 INCH PIPE IS  20.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  17.24
 ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      60.69
 PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =   12.68
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     26.00 =    2815.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     26.00 TO NODE     26.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   12.68
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.849
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       B        0.33      0.30     0.600    56
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       C        3.00      0.25     0.600    69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA AREA(ACRES) =    3.33      SUBAREA RUNOFF(CFS) =    8.08
 EFFECTIVE AREA(ACRES) =     27.98   AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.71
 TOTAL AREA(ACRES) =       28.0       PEAK FLOW RATE(CFS) =      67.93

****************************************************************************
 FLOW PROCESS FROM NODE     26.00 TO NODE     27.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   367.00  DOWNSTREAM(FEET) =   347.00
 FLOW LENGTH(FEET) =   480.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  30.0 INCH PIPE IS  20.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  18.60
 ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      67.93
 PIPE TRAVEL TIME(MIN.) =   0.43    Tc(MIN.) =   13.11
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     27.00 =    3295.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     27.00 TO NODE     27.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   13.11
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.795
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       B        2.00      0.30     0.600    56
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       C        0.50      0.25     0.600    69
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       D        2.16      0.20     0.600    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
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  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA AREA(ACRES) =    4.66      SUBAREA RUNOFF(CFS) =   11.10
  EFFECTIVE AREA(ACRES) =     32.64   AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  0.69
  TOTAL AREA(ACRES) =       32.6       PEAK FLOW RATE(CFS) =      77.68

****************************************************************************
  FLOW PROCESS FROM NODE     27.00 TO NODE     35.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    347.00  DOWNSTREAM(FEET) =    345.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    70.00   CHANNEL SLOPE =  0.0286
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   5.00
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.783
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                B       0.13      0.30     0.850    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      77.83
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  11.15
  AVERAGE FLOW DEPTH(FEET) =   0.62   TRAVEL TIME(MIN.) =   0.10
  Tc(MIN.) =   13.21
  SUBAREA AREA(ACRES) =     0.13       SUBAREA RUNOFF(CFS) =    0.30
  EFFECTIVE AREA(ACRES) =     32.77     AREA-AVERAGED Fm(INCH/HR) =   0.15
  AREA-AVERAGED Fp(INCH/HR) =   0.22  AREA-AVERAGED Ap =   0.69
  TOTAL AREA(ACRES) =       32.8         PEAK FLOW RATE(CFS) =      77.68
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.62   FLOW VELOCITY(FEET/SEC.) =  11.13
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     35.00 =    3365.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     35.00 TO NODE     35.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   13.21
  RAINFALL INTENSITY(INCH/HR) =   2.78
  AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.22
  AREA-AVERAGED Ap =  0.69
  EFFECTIVE STREAM AREA(ACRES) =      32.77
  TOTAL STREAM AREA(ACRES) =      32.77
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      77.68

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   250.00
  ELEVATION DATA: UPSTREAM(FEET) =    393.00  DOWNSTREAM(FEET) =    372.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.824
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D       0.10      0.20     0.100    75    5.00
  PUBLIC PARK                C       0.30      0.25     0.850    69    7.22
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.663
  SUBAREA RUNOFF(CFS) =      1.68
  TOTAL AREA(ACRES) =      0.40   PEAK FLOW RATE(CFS) =      1.68

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    372.00  DOWNSTREAM(FEET) =    361.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   335.00   CHANNEL SLOPE =  0.0328
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.025
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                B       1.33      0.30     0.850    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.94
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.96
  AVERAGE FLOW DEPTH(FEET) =   0.22   TRAVEL TIME(MIN.) =   1.89
  Tc(MIN.) =    6.89
  SUBAREA AREA(ACRES) =     1.33       SUBAREA RUNOFF(CFS) =    4.51
  EFFECTIVE AREA(ACRES) =      1.73     AREA-AVERAGED Fm(INCH/HR) =   0.23
  AREA-AVERAGED Fp(INCH/HR) =   0.29  AREA-AVERAGED Ap =   0.81
  TOTAL AREA(ACRES) =        1.7         PEAK FLOW RATE(CFS) =       5.90

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.28   FLOW VELOCITY(FEET/SEC.) =   3.33
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =     585.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE     33.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    361.00  DOWNSTREAM(FEET) =    350.00
```

```
 CHANNEL LENGTH THRU SUBAREA(FEET) =   263.00   CHANNEL SLOPE =  0.0418
 CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   5.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.702
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                B       1.27      0.30     0.850    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.87
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.00
 AVERAGE FLOW DEPTH(FEET) =   0.30   TRAVEL TIME(MIN.) =   1.10
 Tc(MIN.) =    7.98
 SUBAREA AREA(ACRES) =     1.27       SUBAREA RUNOFF(CFS) =    3.94
 EFFECTIVE AREA(ACRES) =      3.00     AREA-AVERAGED Fm(INCH/HR) =   0.24
 AREA-AVERAGED Fp(INCH/HR) =   0.29  AREA-AVERAGED Ap =   0.82
 TOTAL AREA(ACRES) =        3.0         PEAK FLOW RATE(CFS) =       9.34

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.33   FLOW VELOCITY(FEET/SEC.) =   4.21
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     33.00 =     848.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     33.00 TO NODE     35.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   350.00  DOWNSTREAM(FEET) =   345.00
 FLOW LENGTH(FEET) =    80.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  13.35
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       9.34
 PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    8.08
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     35.00 =     928.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     35.00 TO NODE     35.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.08
 RAINFALL INTENSITY(INCH/HR) =   3.68
 AREA-AVERAGED Fm(INCH/HR) =  0.24
 AREA-AVERAGED Fp(INCH/HR) =  0.29
 AREA-AVERAGED Ap =  0.82
 EFFECTIVE STREAM AREA(ACRES) =       3.00
 TOTAL STREAM AREA(ACRES) =       3.00
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       9.34

 ** CONFLUENCE DATA **
  STREAM       Q       Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       75.47    9.74    3.307  0.22( 0.15) 0.68      26.5      20.00
     1       77.68   13.21    2.783  0.22( 0.15) 0.69      32.8      10.00
     2        9.34    8.08    3.676  0.29( 0.24) 0.82       3.0      30.00

 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       79.26    8.08    3.676  0.23( 0.16) 0.70      25.0      30.00
     2       83.80    9.74    3.307  0.23( 0.16) 0.70      29.5      20.00
     3       84.59   13.21    2.783  0.23( 0.16) 0.70      35.8      10.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      84.59    Tc(MIN.) =     13.21
 EFFECTIVE AREA(ACRES) =      35.77   AREA-AVERAGED Fm(INCH/HR) =  0.16
 AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap =  0.70
 TOTAL AREA(ACRES) =       35.8
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     35.00 =    3365.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     35.00 TO NODE     45.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    345.00  DOWNSTREAM(FEET) =    339.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   275.00   CHANNEL SLOPE =  0.0218
 CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   5.00
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.732
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                B       0.58      0.30     0.850    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      85.24
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  10.57
 AVERAGE FLOW DEPTH(FEET) =   0.71   TRAVEL TIME(MIN.) =   0.43
 Tc(MIN.) =   13.65
 SUBAREA AREA(ACRES) =     0.58       SUBAREA RUNOFF(CFS) =    1.29
 EFFECTIVE AREA(ACRES) =     36.35     AREA-AVERAGED Fm(INCH/HR) =   0.16
 AREA-AVERAGED Fp(INCH/HR) =   0.23  AREA-AVERAGED Ap =   0.71
 TOTAL AREA(ACRES) =       36.4         PEAK FLOW RATE(CFS) =      84.59
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.70   FLOW VELOCITY(FEET/SEC.) =  10.52
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     45.00 =    3640.00 FEET.

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

```
 FLOW PROCESS FROM NODE     45.00 TO NODE     45.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   13.65
 RAINFALL INTENSITY(INCH/HR) =   2.73
 AREA-AVERAGED Fm(INCH/HR) =  0.16
 AREA-AVERAGED Fp(INCH/HR) =  0.23
 AREA-AVERAGED Ap =  0.71
 EFFECTIVE STREAM AREA(ACRES) =      36.35
 TOTAL STREAM AREA(ACRES) =      36.35
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      84.59

****************************************************************************
 FLOW PROCESS FROM NODE     40.00 TO NODE     41.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   160.00
 ELEVATION DATA: UPSTREAM(FEET) =    388.20  DOWNSTREAM(FEET) =    378.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.378
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.203
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 PUBLIC PARK                B       0.20      0.30     0.850    56    6.38
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 SUBAREA RUNOFF(CFS) =      0.71
 TOTAL AREA(ACRES) =      0.20   PEAK FLOW RATE(CFS) =      0.71

****************************************************************************
 FLOW PROCESS FROM NODE     41.00 TO NODE     42.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    378.00  DOWNSTREAM(FEET) =    364.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   260.00   CHANNEL SLOPE =  0.0538
 CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.742
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                B       0.23      0.30     0.850    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      1.07
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.99
 AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   1.45
 Tc(MIN.) =    7.83
 SUBAREA AREA(ACRES) =     0.23       SUBAREA RUNOFF(CFS) =    0.72
 EFFECTIVE AREA(ACRES) =      0.43     AREA-AVERAGED Fm(INCH/HR) =  0.26
 AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.85
 TOTAL AREA(ACRES) =        0.4         PEAK FLOW RATE(CFS) =      1.35

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.18   FLOW VELOCITY(FEET/SEC.) =   3.21
 LONGEST FLOWPATH FROM NODE     40.00 TO NODE     42.00 =     420.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     42.00 TO NODE     43.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    364.00  DOWNSTREAM(FEET) =    354.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   275.00   CHANNEL SLOPE =  0.0364
 CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.389
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                B       0.23      0.30     0.850    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      1.67
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.05
 AVERAGE FLOW DEPTH(FEET) =   0.22   TRAVEL TIME(MIN.) =   1.50
 Tc(MIN.) =    9.33
 SUBAREA AREA(ACRES) =     0.23       SUBAREA RUNOFF(CFS) =    0.65
 EFFECTIVE AREA(ACRES) =      0.66     AREA-AVERAGED Fm(INCH/HR) =  0.26
 AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.85
 TOTAL AREA(ACRES) =        0.7         PEAK FLOW RATE(CFS) =      1.86

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.24   FLOW VELOCITY(FEET/SEC.) =   3.14
 LONGEST FLOWPATH FROM NODE     40.00 TO NODE     43.00 =     695.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     43.00 TO NODE     44.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    354.00  DOWNSTREAM(FEET) =    345.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   260.00   CHANNEL SLOPE =  0.0346
 CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.135
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                B       0.12      0.30     0.850    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
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  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.02
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.16
  AVERAGE FLOW DEPTH(FEET) =   0.25   TRAVEL TIME(MIN.) =   1.37
  Tc(MIN.) =   10.70
  SUBAREA AREA(ACRES) =     0.12       SUBAREA RUNOFF(CFS) =    0.31
  EFFECTIVE AREA(ACRES) =      0.78     AREA-AVERAGED Fm(INCH/HR) =   0.25
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.85
  TOTAL AREA(ACRES) =        0.8         PEAK FLOW RATE(CFS) =       2.02

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.25   FLOW VELOCITY(FEET/SEC.) =   3.16
  LONGEST FLOWPATH FROM NODE     40.00 TO NODE     44.00 =     955.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     44.00 TO NODE     45.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    345.00  DOWNSTREAM(FEET) =    339.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    40.00   CHANNEL SLOPE =  0.1500
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   5.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       2.02
  FLOW VELOCITY(FEET/SEC.) =   4.67   FLOW DEPTH(FEET) =   0.04
  TRAVEL TIME(MIN.) =   0.14   Tc(MIN.) =   10.85
  LONGEST FLOWPATH FROM NODE     40.00 TO NODE     45.00 =     995.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     45.00 TO NODE     45.00 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.) =   10.85
  RAINFALL INTENSITY(INCH/HR) =   3.11
  AREA-AVERAGED Fm(INCH/HR) =  0.25
  AREA-AVERAGED Fp(INCH/HR) =  0.30
  AREA-AVERAGED Ap =  0.85
  EFFECTIVE STREAM AREA(ACRES) =       0.78
  TOTAL STREAM AREA(ACRES) =       0.78
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.02

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       79.26    8.52    3.566  0.23( 0.16) 0.70      25.6      30.00
      1       83.80   10.18    3.226  0.23( 0.16) 0.70      30.1      20.00
      1       84.59   13.65    2.732  0.23( 0.16) 0.71      36.4      10.00
      2        2.02   10.85    3.112  0.30( 0.25) 0.85       0.8      40.00

  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       81.10    8.52    3.566  0.24( 0.17) 0.71      26.2      30.00
      2       85.78   10.18    3.226  0.23( 0.16) 0.70      30.8      20.00
      3       85.98   10.85    3.112  0.23( 0.16) 0.70      32.1      40.00
      4       86.35   13.65    2.732  0.23( 0.16) 0.71      37.1      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      86.35    Tc(MIN.) =     13.65
  EFFECTIVE AREA(ACRES) =      37.13   AREA-AVERAGED Fm(INCH/HR) =  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap =  0.71
  TOTAL AREA(ACRES) =       37.1
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     45.00 =    3640.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       37.1  TC(MIN.) =     13.65
  EFFECTIVE AREA(ACRES) =     37.13  AREA-AVERAGED Fm(INCH/HR)=  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap = 0.709
  PEAK FLOW RATE(CFS)   =      86.35

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       81.10    8.52    3.566  0.24( 0.17) 0.71      26.2      30.00
      2       85.78   10.18    3.226  0.23( 0.16) 0.70      30.8      20.00
      3       85.98   10.85    3.112  0.23( 0.16) 0.70      32.1      40.00
      4       86.35   13.65    2.732  0.23( 0.16) 0.71      37.1      10.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

C. 100-YEAR STORM

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****************************************************************************
           RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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                          Analysis prepared by:

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 ************************* DESCRIPTION OF STUDY *************************
* Hydrology Study for Crawford Park                                         *
* Existing Condition                                                        *
* 100-year Storm                                                            *
 ************************************************************************

  FILE NAME: CPEX.DAT
  TIME/DATE OF STUDY: 19:27 11/13/2020
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   280.00
  ELEVATION DATA: UPSTREAM(FEET) =    915.00  DOWNSTREAM(FEET) =    750.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.475
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.914
  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 FAIR COVER
  "OPEN BRUSH"               C        1.19      0.25     1.000    92   7.47
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      5.00
  TOTAL AREA(ACRES) =      1.19   PEAK FLOW RATE(CFS) =      5.00

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    750.00  DOWNSTREAM(FEET) =    600.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   325.00   CHANNEL SLOPE =  0.4615
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =      5.00
  FLOW VELOCITY(FEET/SEC) =   6.67 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.81   Tc(MIN.) =    8.29
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     605.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.29
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.632
  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
  "OPEN BRUSH"               C        0.90      0.25     1.000    92
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        0.24      0.20     1.000    96
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.24
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    1.14      SUBAREA RUNOFF(CFS) =    4.51
  EFFECTIVE AREA(ACRES) =      2.33   AREA-AVERAGED Fm(INCH/HR) =  0.24
  AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =        2.3       PEAK FLOW RATE(CFS) =       9.20

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  600.00  DOWNSTREAM ELEVATION(FEET) =  503.00
```

```
 STREET LENGTH(FEET) =   730.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

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

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

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      15.58
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.33
   HALFSTREET FLOOD WIDTH(FEET) =    9.47
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    7.83
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    2.60
 STREET FLOW TRAVEL TIME(MIN.) =   1.55   Tc(MIN.) =    9.84
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.198
 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"         D        3.49      0.20     0.700    91
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
 SUBAREA AREA(ACRES) =    3.49      SUBAREA RUNOFF(CFS) =   12.75
 EFFECTIVE AREA(ACRES) =      5.82    AREA-AVERAGED Fm(INCH/HR) =  0.18
 AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  0.82
 TOTAL AREA(ACRES) =        5.8        PEAK FLOW RATE(CFS) =      21.03

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  10.90
 FLOW VELOCITY(FEET/SEC.) =  8.38   DEPTH*VELOCITY(FT*FT/SEC.) =   2.99
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     13.00 =    1335.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     13.00 TO NODE     14.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  503.00  DOWNSTREAM ELEVATION(FEET) =  395.00
 STREET LENGTH(FEET) =  1085.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

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

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

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      30.46
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.41
   HALFSTREET FLOOD WIDTH(FEET) =   13.71
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    8.13
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    3.31
 STREET FLOW TRAVEL TIME(MIN.) =   2.22   Tc(MIN.) =   12.06
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.735
 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"         D        5.82      0.20     0.700    91
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
 SUBAREA AREA(ACRES) =    5.82      SUBAREA RUNOFF(CFS) =   18.83
 EFFECTIVE AREA(ACRES) =     11.64    AREA-AVERAGED Fm(INCH/HR) =  0.16
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.76
 TOTAL AREA(ACRES) =       11.6        PEAK FLOW RATE(CFS) =      37.44

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.43   HALFSTREET FLOOD WIDTH(FEET) =  14.96
 FLOW VELOCITY(FEET/SEC.) =  8.54   DEPTH*VELOCITY(FT*FT/SEC.) =   3.67
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     14.00 =    2420.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     14.00 TO NODE     15.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   395.00  DOWNSTREAM(FEET) =   394.00
 FLOW LENGTH(FEET) =    45.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.66
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      37.44
 PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =   12.12
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     15.00 =    2465.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   12.12
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.725
 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"         D       10.89      0.20     0.700    91
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
 SUBAREA AREA(ACRES) =   10.89      SUBAREA RUNOFF(CFS) =   35.13
 EFFECTIVE AREA(ACRES) =     22.53   AREA-AVERAGED Fm(INCH/HR) =  0.15
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 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.73
 TOTAL AREA(ACRES) =       22.5      PEAK FLOW RATE(CFS) =      72.47

****************************************************************************
 FLOW PROCESS FROM NODE     15.00 TO NODE     25.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   394.00  DOWNSTREAM(FEET) =   371.00
 FLOW LENGTH(FEET) =   240.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  17.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  25.96
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      72.47
 PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =   12.28
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     25.00 =    2705.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     25.00 TO NODE     25.00 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.) =   12.28
 RAINFALL INTENSITY(INCH/HR) =   3.70
 AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.21
 AREA-AVERAGED Ap =  0.73
 EFFECTIVE STREAM AREA(ACRES) =      22.53
 TOTAL STREAM AREA(ACRES) =      22.53
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      72.47

****************************************************************************
 FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   295.00
 ELEVATION DATA: UPSTREAM(FEET) =    460.00  DOWNSTREAM(FEET) =    436.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.036
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.087
 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
 "2 DWELLINGS/ACRE"         C       1.17      0.25     0.700    86    7.04
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
 SUBAREA RUNOFF(CFS) =      5.17
 TOTAL AREA(ACRES) =      1.17   PEAK FLOW RATE(CFS) =      5.17
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****************************************************************************
 FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  436.00  DOWNSTREAM ELEVATION(FEET) =  385.00
 STREET LENGTH(FEET) =   625.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

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

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

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.05
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.34
   HALFSTREET FLOOD WIDTH(FEET) =   10.12
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    6.36
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    2.18
 STREET FLOW TRAVEL TIME(MIN.) =   1.64   Tc(MIN.) =    8.67
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.513
 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"         C       0.65      0.25     0.700    86
 COMMERCIAL                 C       0.30      0.25     0.100    86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.511
 SUBAREA AREA(ACRES) =    0.95      SUBAREA RUNOFF(CFS) =    3.75
 EFFECTIVE AREA(ACRES) =      2.12    AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.62
 TOTAL AREA(ACRES) =       2.1       PEAK FLOW RATE(CFS) =      8.32

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  10.98
 FLOW VELOCITY(FEET/SEC.) =  6.55   DEPTH*VELOCITY(FT*FT/SEC.) =   2.35
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =     920.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     22.00 TO NODE     25.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   385.00  DOWNSTREAM(FEET) =   371.00
 FLOW LENGTH(FEET) =   225.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.92
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 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       8.32
 PIPE TRAVEL TIME(MIN.) =   0.29    Tc(MIN.) =    8.96
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     25.00 =    1145.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     25.00 TO NODE     25.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.96
 RAINFALL INTENSITY(INCH/HR) =   4.43
 AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.62
 EFFECTIVE STREAM AREA(ACRES) =       2.12
 TOTAL STREAM AREA(ACRES) =       2.12
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       8.32

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       72.47   12.28    3.698  0.21( 0.15) 0.73      22.5      10.00
     2        8.32    8.96    4.428  0.25( 0.15) 0.62       2.1      20.00

 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       72.12    8.96    4.428  0.21( 0.15) 0.72      18.6      20.00
     2       79.36   12.28    3.698  0.21( 0.15) 0.72      24.6      10.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      79.36    Tc(MIN.) =    12.28
 EFFECTIVE AREA(ACRES) =      24.65   AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.72
 TOTAL AREA(ACRES) =       24.6
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     25.00 =    2705.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     25.00 TO NODE     26.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   371.00  DOWNSTREAM(FEET) =   367.00
 FLOW LENGTH(FEET) =   110.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  33.0 INCH PIPE IS  22.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  18.42
 ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      79.36
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 PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =   12.38
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     26.00 =    2815.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     26.00 TO NODE     26.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   12.38
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.681
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       B        0.33      0.30     0.600    76
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       C        3.00      0.25     0.600    86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA AREA(ACRES) =    3.33      SUBAREA RUNOFF(CFS) =   10.57
 EFFECTIVE AREA(ACRES) =     27.98   AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.71
 TOTAL AREA(ACRES) =       28.0       PEAK FLOW RATE(CFS) =      88.88

****************************************************************************
 FLOW PROCESS FROM NODE     26.00 TO NODE     27.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   367.00  DOWNSTREAM(FEET) =   347.00
 FLOW LENGTH(FEET) =   480.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  33.0 INCH PIPE IS  23.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  19.87
 ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      88.88
 PIPE TRAVEL TIME(MIN.) =   0.40    Tc(MIN.) =   12.78
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     27.00 =    3295.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     27.00 TO NODE     27.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   12.78
 * 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
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       B        2.00      0.30     0.600    76
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       C        0.50      0.25     0.600    86
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       D        2.16      0.20     0.600    91
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
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  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA AREA(ACRES) =    4.66      SUBAREA RUNOFF(CFS) =   14.53
  EFFECTIVE AREA(ACRES) =     32.64   AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  0.69
  TOTAL AREA(ACRES) =       32.6       PEAK FLOW RATE(CFS) =     101.73

****************************************************************************
  FLOW PROCESS FROM NODE     27.00 TO NODE     35.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    347.00  DOWNSTREAM(FEET) =    345.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    70.00   CHANNEL SLOPE =  0.0286
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   5.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.599
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                B       0.13      0.30     0.850    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     101.92
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  12.23
  AVERAGE FLOW DEPTH(FEET) =   0.73   TRAVEL TIME(MIN.) =   0.10
  Tc(MIN.) =   12.87
  SUBAREA AREA(ACRES) =     0.13       SUBAREA RUNOFF(CFS) =    0.39
  EFFECTIVE AREA(ACRES) =     32.77     AREA-AVERAGED Fm(INCH/HR) =   0.15
  AREA-AVERAGED Fp(INCH/HR) =   0.22  AREA-AVERAGED Ap =   0.69
  TOTAL AREA(ACRES) =       32.8         PEAK FLOW RATE(CFS) =     101.73
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.72   FLOW VELOCITY(FEET/SEC.) =  12.31
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     35.00 =    3365.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     35.00 TO NODE     35.00 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.) =   12.87
  RAINFALL INTENSITY(INCH/HR) =   3.60
  AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.22
  AREA-AVERAGED Ap =  0.69
  EFFECTIVE STREAM AREA(ACRES) =      32.77
  TOTAL STREAM AREA(ACRES) =      32.77
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     101.73

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   250.00
  ELEVATION DATA: UPSTREAM(FEET) =    393.00  DOWNSTREAM(FEET) =    372.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.187
  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                 D       0.10      0.20     0.100    91    5.00
  PUBLIC PARK                C       0.30      0.25     0.850    86    7.22
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.663
  SUBAREA RUNOFF(CFS) =      2.17
  TOTAL AREA(ACRES) =      0.40   PEAK FLOW RATE(CFS) =      2.17

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    372.00  DOWNSTREAM(FEET) =    361.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   335.00   CHANNEL SLOPE =  0.0328
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.212
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                B       1.33      0.30     0.850    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.15
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.20
  AVERAGE FLOW DEPTH(FEET) =   0.26   TRAVEL TIME(MIN.) =   1.75
  Tc(MIN.) =    6.75
  SUBAREA AREA(ACRES) =     1.33       SUBAREA RUNOFF(CFS) =    5.93
  EFFECTIVE AREA(ACRES) =      1.73     AREA-AVERAGED Fm(INCH/HR) =   0.23
  AREA-AVERAGED Fp(INCH/HR) =   0.29  AREA-AVERAGED Ap =   0.81
  TOTAL AREA(ACRES) =        1.7         PEAK FLOW RATE(CFS) =       7.75

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.32   FLOW VELOCITY(FEET/SEC.) =   3.62
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =     585.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE     33.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    361.00  DOWNSTREAM(FEET) =    350.00
```

```
 CHANNEL LENGTH THRU SUBAREA(FEET) =   263.00   CHANNEL SLOPE =  0.0418
 CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   5.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.810
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                B       1.27      0.30     0.850    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      10.36
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.32
 AVERAGE FLOW DEPTH(FEET) =   0.35   TRAVEL TIME(MIN.) =   1.01
 Tc(MIN.) =    7.76
 SUBAREA AREA(ACRES) =     1.27       SUBAREA RUNOFF(CFS) =    5.21
 EFFECTIVE AREA(ACRES) =      3.00     AREA-AVERAGED Fm(INCH/HR) =   0.24
 AREA-AVERAGED Fp(INCH/HR) =   0.29  AREA-AVERAGED Ap =   0.82
 TOTAL AREA(ACRES) =        3.0         PEAK FLOW RATE(CFS) =      12.33

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.39   FLOW VELOCITY(FEET/SEC.) =   4.52
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     33.00 =     848.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     33.00 TO NODE     35.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   350.00  DOWNSTREAM(FEET) =   345.00
 FLOW LENGTH(FEET) =    80.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  14.35
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      12.33
 PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    7.85
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     35.00 =     928.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     35.00 TO NODE     35.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    7.85
 RAINFALL INTENSITY(INCH/HR) =   4.78
 AREA-AVERAGED Fm(INCH/HR) =  0.24
 AREA-AVERAGED Fp(INCH/HR) =  0.29
 AREA-AVERAGED Ap =  0.82
 EFFECTIVE STREAM AREA(ACRES) =       3.00
 TOTAL STREAM AREA(ACRES) =       3.00
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      12.33
```

```
 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       98.93    9.57    4.265  0.22( 0.15) 0.68      26.7      20.00
     1      101.73   12.87    3.599  0.22( 0.15) 0.69      32.8      10.00
     2       12.33    7.85    4.777  0.29( 0.24) 0.82       3.0      30.00

 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      103.61    7.85    4.777  0.23( 0.16) 0.70      24.9      30.00
     2      109.87    9.57    4.265  0.23( 0.16) 0.70      29.7      20.00
     3      110.85   12.87    3.599  0.23( 0.16) 0.70      35.8      10.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =     110.85    Tc(MIN.) =     12.87
 EFFECTIVE AREA(ACRES) =      35.77   AREA-AVERAGED Fm(INCH/HR) =  0.16
 AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap =  0.70
 TOTAL AREA(ACRES) =       35.8
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     35.00 =    3365.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     35.00 TO NODE     45.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    345.00  DOWNSTREAM(FEET) =    339.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   275.00   CHANNEL SLOPE =  0.0218
 CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   5.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.537
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                B       0.58      0.30     0.850    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     111.71
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  11.59
 AVERAGE FLOW DEPTH(FEET) =   0.83   TRAVEL TIME(MIN.) =   0.40
 Tc(MIN.) =   13.27
 SUBAREA AREA(ACRES) =     0.58       SUBAREA RUNOFF(CFS) =    1.71
 EFFECTIVE AREA(ACRES) =     36.35     AREA-AVERAGED Fm(INCH/HR) =   0.16
 AREA-AVERAGED Fp(INCH/HR) =   0.23  AREA-AVERAGED Ap =   0.71
 TOTAL AREA(ACRES) =       36.4         PEAK FLOW RATE(CFS) =     110.85
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.82   FLOW VELOCITY(FEET/SEC.) =  11.60
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     45.00 =    3640.00 FEET.

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

```
 FLOW PROCESS FROM NODE     45.00 TO NODE     45.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   13.27
 RAINFALL INTENSITY(INCH/HR) =   3.54
 AREA-AVERAGED Fm(INCH/HR) =  0.16
 AREA-AVERAGED Fp(INCH/HR) =  0.23
 AREA-AVERAGED Ap =  0.71
 EFFECTIVE STREAM AREA(ACRES) =      36.35
 TOTAL STREAM AREA(ACRES) =      36.35
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     110.85

****************************************************************************
 FLOW PROCESS FROM NODE     40.00 TO NODE     41.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   160.00
 ELEVATION DATA: UPSTREAM(FEET) =    388.20  DOWNSTREAM(FEET) =    378.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.378
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.382
 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.)
 PUBLIC PARK                B       0.20      0.30     0.850    76    6.38
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 SUBAREA RUNOFF(CFS) =      0.92
 TOTAL AREA(ACRES) =      0.20   PEAK FLOW RATE(CFS) =      0.92

****************************************************************************
 FLOW PROCESS FROM NODE     41.00 TO NODE     42.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    378.00  DOWNSTREAM(FEET) =    364.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   260.00   CHANNEL SLOPE =  0.0538
 CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.832
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                B       0.23      0.30     0.850    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      1.40
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.28
 AVERAGE FLOW DEPTH(FEET) =   0.18   TRAVEL TIME(MIN.) =   1.32
 Tc(MIN.) =    7.70
 SUBAREA AREA(ACRES) =     0.23       SUBAREA RUNOFF(CFS) =    0.95
 EFFECTIVE AREA(ACRES) =      0.43     AREA-AVERAGED Fm(INCH/HR) =  0.26
 AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.85
 TOTAL AREA(ACRES) =       0.4         PEAK FLOW RATE(CFS) =      1.77

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.21   FLOW VELOCITY(FEET/SEC.) =   3.51
 LONGEST FLOWPATH FROM NODE     40.00 TO NODE     42.00 =     420.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     42.00 TO NODE     43.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    364.00  DOWNSTREAM(FEET) =    354.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   275.00   CHANNEL SLOPE =  0.0364
 CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.396
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                B       0.23      0.30     0.850    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      2.20
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.32
 AVERAGE FLOW DEPTH(FEET) =   0.26   TRAVEL TIME(MIN.) =   1.38
 Tc(MIN.) =    9.08
 SUBAREA AREA(ACRES) =     0.23       SUBAREA RUNOFF(CFS) =    0.86
 EFFECTIVE AREA(ACRES) =      0.66     AREA-AVERAGED Fm(INCH/HR) =  0.26
 AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.85
 TOTAL AREA(ACRES) =       0.7         PEAK FLOW RATE(CFS) =      2.46

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.28   FLOW VELOCITY(FEET/SEC.) =   3.44
 LONGEST FLOWPATH FROM NODE     40.00 TO NODE     43.00 =     695.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     43.00 TO NODE     44.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    354.00  DOWNSTREAM(FEET) =    345.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   260.00   CHANNEL SLOPE =  0.0346
 CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.085
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                B       0.12      0.30     0.850    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
```

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 2.67
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 3.50
AVERAGE FLOW DEPTH(FEET) = 0.29 TRAVEL TIME(MIN.) = 1.24
Tc(MIN.) = 10.32
SUBAREA AREA(ACRES) = 0.12 SUBAREA RUNOFF(CFS) = 0.41
EFFECTIVE AREA(ACRES) = 0.78 AREA-AVERAGED Fm(INCH/HR) = 0.25
AREA-AVERAGED Fp(INCH/HR) = 0.30 AREA-AVERAGED Ap = 0.85
TOTAL AREA(ACRES) = 0.8 PEAK FLOW RATE(CFS) = 2.69

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.30 FLOW VELOCITY(FEET/SEC.) = 3.44
LONGEST FLOWPATH FROM NODE 40.00 TO NODE 44.00 = 955.00 FEET.

****
FLOW PROCESS FROM NODE 44.00 TO NODE 45.00 IS CODE = 51

>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==
ELEVATION DATA: UPSTREAM(FEET) = 345.00 DOWNSTREAM(FEET) = 339.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 40.00 CHANNEL SLOPE = 0.1500
CHANNEL BASE(FEET) = 10.00 "Z" FACTOR = 2.000
MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 5.00
CHANNEL FLOW THRU SUBAREA(CFS) = 2.69
FLOW VELOCITY(FEET/SEC.) = 5.27 FLOW DEPTH(FEET) = 0.05
TRAVEL TIME(MIN.) = 0.13 Tc(MIN.) = 10.44
LONGEST FLOWPATH FROM NODE 40.00 TO NODE 45.00 = 995.00 FEET.

****
FLOW PROCESS FROM NODE 45.00 TO NODE 45.00 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.) = 10.44
RAINFALL INTENSITY(INCH/HR) = 4.06
AREA-AVERAGED Fm(INCH/HR) = 0.25
AREA-AVERAGED Fp(INCH/HR) = 0.30
AREA-AVERAGED Ap = 0.85
EFFECTIVE STREAM AREA(ACRES) = 0.78
TOTAL STREAM AREA(ACRES) = 0.78
PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.69

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	103.61	8.26	4.642	0.23(0.16)	0.70	25.5	30.00
1	109.87	9.97	4.167	0.23(0.16)	0.70	30.3	20.00
1	110.85	13.27	3.537	0.23(0.16)	0.71	36.4	10.00
2	2.69	10.44	4.057	0.30(0.25)	0.85	0.8	40.00

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

** PEAK FLOW RATE TABLE **

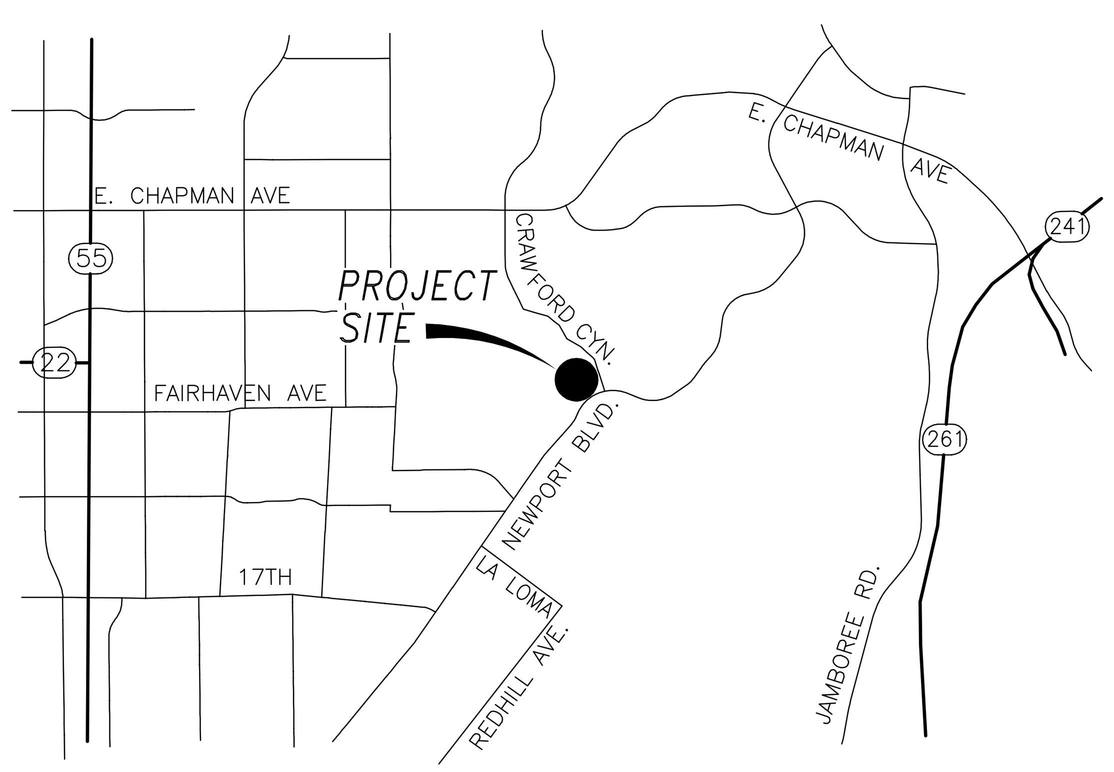
STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	106.06	8.26	4.642	0.24(0.17)	0.71	26.1	30.00
2	112.51	9.97	4.167	0.23(0.16)	0.70	31.0	20.00
3	112.70	10.44	4.057	0.23(0.16)	0.70	31.9	40.00
4	113.17	13.27	3.537	0.23(0.16)	0.71	37.1	10.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 113.17 Tc(MIN.) = 13.27
EFFECTIVE AREA(ACRES) = 37.13 AREA-AVERAGED Fm(INCH/HR) = 0.16
AREA-AVERAGED Fp(INCH/HR) = 0.23 AREA-AVERAGED Ap = 0.71
TOTAL AREA(ACRES) = 37.1
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 45.00 = 3640.00 FEET.
==
END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 37.1 TC(MIN.) = 13.27
EFFECTIVE AREA(ACRES) = 37.13 AREA-AVERAGED Fm(INCH/HR)= 0.16
AREA-AVERAGED Fp(INCH/HR) = 0.23 AREA-AVERAGED Ap = 0.709
PEAK FLOW RATE(CFS) = 113.17

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	106.06	8.26	4.642	0.24(0.17)	0.71	26.1	30.00
2	112.51	9.97	4.167	0.23(0.16)	0.70	31.0	20.00
3	112.70	10.44	4.057	0.23(0.16)	0.70	31.9	40.00
4	113.17	13.27	3.537	0.23(0.16)	0.71	37.1	10.00

==
==
END OF RATIONAL METHOD ANALYSIS



LOCATION MAP

PREPARED FOR:

OCparks

PREPARED BY:

HUNSAKER & ASSOCIATES IRVINE, INC.
PLANNING • ENGINEERING • SURVEYING
Three Hughes • Irvine, CA 92618 • PH: (949) 583-1010 • FX: (949) 583-0759

SCALE: 1" =80'

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

LEGEND

- PROJECT BOUNDARY
- MAJOR DRAINAGE BOUNDARY
- MINOR DRAINAGE BOUNDARY
- FLOW LINE WITH DIRECTION
- 100 NODE NUMBER
- A / 1.0 AREA DESIGNATION / AREA ACREAGE (IN ACRES)
- Q_{100}=8.0cfs t=15.0 PEAK FLOW RATE / TIME OF CONCENTRATION FOR 2-YEAR STORM
- ΣQ_{100}=10.0cfs t=15.0 PEAK CONFLUENCE FLOW RATE / TIME OF CONCENTRATION FOR 2-YEAR STORM
- EXISTING STORM DRAIN
- C / D SOIL GROUP BOUNDARY

EXHIBIT 1
OFF-SITE HYDROLOGY MAP
CRAWFORD PARK
S. CRAWFORD CANYON RD. & NEWPORT BLVD.
TUSTIN, CALIFORNIA 92782

HYDROLOGY MAP FOR CRAWFORD PARK – OFF-SITE

PLOTTED BY: Gary Guan DATE: Nov. 13, 2020 08:16:49 PM FILE: F:\1140\Engineering\SY_Hydrology\Crawford Park Existing Hydrology – Offsite.dwg

LOCATION MAP

PREPARED FOR:

OCparks

PREPARED BY:

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Three Hughes • Irvine, CA 92618 • PH: (949) 583-1010 • FX: (949) 583-0759

SCALE: 1" = 50'

50 25 0 50 100 150

GRAPHIC SCALE 1" = 50'

LEGEND

- PROJECT BOUNDARY
- MAJOR DRAINAGE BOUNDARY
- MINOR DRAINAGE BOUNDARY
- FLOW LINE WITH DIRECTION
- NODE NUMBER
- AREA DESIGNATION / AREA ACREAGE (IN ACRES)
- PEAK FLOW RATE / TIME OF CONCENTRATION FOR 2-YEAR STORM
- PEAK CONFLUENCE FLOW RATE / TIME OF CONCENTRATION FOR 2-YEAR STORM
- EXISTING STORM DRAIN
- SOIL GROUP BOUNDARY

EXHIBIT 2
EXISTING CONDITION HYDROLOGY MAP (ONSITE)
CRAWFORD PARK
S. CRAWFORD CANYON RD. & NEWPORT BLVD.
TUSTIN, CALIFORNIA 92782

HYDROLOGY MAP FOR CRAWFORD PARK – ON-SITE

PLOTTED BY: Gary Guan DATE: Nov. 15, 2020 07:28:11 PM FILE: F:\1140\Engineering\SY_Hydrology\Crawford Park Existing Hydrology – Onsite.dwg

SECTION III
PROPOSED CONDITION HYDROLOGY CALCULATIONS &MAP

A. 2-YEAR STORM

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******************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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                           Analysis prepared by:

                           HUNSAKER & ASSOCIATES
                                 Irvine,Inc
                     Planning * Engineering * Surveying
          Three Hughes * Irvine, California 92618 * (949)583-1010

 ************************** DESCRIPTION OF STUDY **************************
* Hydrology Study for Crawford Park                                          *
* Proposed Condition                                                         *
* 2-year Storm                                                               *
 **************************************************************************

  FILE NAME: CPPR.DAT
  TIME/DATE OF STUDY: 15:44 11/14/2020
------------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------------
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)    (FT)     SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

******************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   280.00
  ELEVATION DATA: UPSTREAM(FEET) =    915.00  DOWNSTREAM(FEET) =    750.00
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```
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.475
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.797
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"               C        1.19      0.25     1.000    59   7.47
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      1.66
  TOTAL AREA(ACRES) =      1.19   PEAK FLOW RATE(CFS) =      1.66

******************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  52
------------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    750.00  DOWNSTREAM(FEET) =    600.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   325.00   CHANNEL SLOPE =  0.4615
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =      1.66
  FLOW VELOCITY(FEET/SEC) =   5.24 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.03   Tc(MIN.) =    8.51
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =    605.00 FEET.

******************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 IS CODE =  81
------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
  MAINLINE Tc(MIN.) =    8.51
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.668
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"               C        0.90      0.25     1.000    59
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        0.24      0.20     1.000    67
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.24
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    1.14      SUBAREA RUNOFF(CFS) =    1.47
  EFFECTIVE AREA(ACRES) =      2.33   AREA-AVERAGED Fm(INCH/HR) =  0.24
  AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       2.3       PEAK FLOW RATE(CFS) =      2.98

******************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  62
------------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
==============================================================================
  UPSTREAM ELEVATION(FEET) =  600.00  DOWNSTREAM ELEVATION(FEET) =  503.00
```

```
  STREET LENGTH(FEET) =   730.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.11
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.25
    HALFSTREET FLOOD WIDTH(FEET) =    4.66
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    6.59
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.62
  STREET FLOW TRAVEL TIME(MIN.) =   1.85   Tc(MIN.) =   10.35
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.491
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "2 DWELLINGS/ACRE"         D        3.49      0.20     0.700    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
  SUBAREA AREA(ACRES) =    3.49      SUBAREA RUNOFF(CFS) =    4.24
  EFFECTIVE AREA(ACRES) =      5.82    AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  0.82
  TOTAL AREA(ACRES) =        5.8       PEAK FLOW RATE(CFS) =       6.85

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.27   HALFSTREET FLOOD WIDTH(FEET) =   5.91
  FLOW VELOCITY(FEET/SEC.) =  6.78   DEPTH*VELOCITY(FT*FT/SEC.) =   1.82
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     13.00 =    1335.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     14.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  503.00  DOWNSTREAM ELEVATION(FEET) =  395.00
  STREET LENGTH(FEET) =  1085.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

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

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

```
    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       9.89
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.31
    HALFSTREET FLOOD WIDTH(FEET) =    8.09
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    6.35
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.95
  STREET FLOW TRAVEL TIME(MIN.) =   2.85   Tc(MIN.) =   13.20
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.296
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "2 DWELLINGS/ACRE"         D        5.82      0.20     0.700    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
  SUBAREA AREA(ACRES) =    5.82      SUBAREA RUNOFF(CFS) =    6.06
  EFFECTIVE AREA(ACRES) =     11.64    AREA-AVERAGED Fm(INCH/HR) =  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.76
  TOTAL AREA(ACRES) =       11.6       PEAK FLOW RATE(CFS) =      11.90

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =   8.91
  FLOW VELOCITY(FEET/SEC.) =  6.59   DEPTH*VELOCITY(FT*FT/SEC.) =   2.12
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     14.00 =    2420.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     15.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   395.00  DOWNSTREAM(FEET) =   394.00
  FLOW LENGTH(FEET) =    45.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.55
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.90
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =   13.28
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     15.00 =    2465.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   13.28
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.292
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "2 DWELLINGS/ACRE"         D       10.89      0.20     0.700    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
  SUBAREA AREA(ACRES) =   10.89      SUBAREA RUNOFF(CFS) =   11.29
  EFFECTIVE AREA(ACRES) =     22.53   AREA-AVERAGED Fm(INCH/HR) =  0.15
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  AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.73
  TOTAL AREA(ACRES) =       22.5      PEAK FLOW RATE(CFS) =      23.14

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     25.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   394.00  DOWNSTREAM(FEET) =   371.00
  FLOW LENGTH(FEET) =   240.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  19.58
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      23.14
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =   13.49
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     25.00 =    2705.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     25.00 TO NODE     25.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   13.49
  RAINFALL INTENSITY(INCH/HR) =   1.28
  AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.21
  AREA-AVERAGED Ap =  0.73
  EFFECTIVE STREAM AREA(ACRES) =      22.53
  TOTAL STREAM AREA(ACRES) =      22.53
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      23.14

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   295.00
  ELEVATION DATA: UPSTREAM(FEET) =    460.00  DOWNSTREAM(FEET) =    436.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.036
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.861
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "2 DWELLINGS/ACRE"         C       1.17      0.25     0.700    50    7.04
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
  SUBAREA RUNOFF(CFS) =      1.77
  TOTAL AREA(ACRES) =      1.17   PEAK FLOW RATE(CFS) =      1.77

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  436.00  DOWNSTREAM ELEVATION(FEET) =  385.00
  STREET LENGTH(FEET) =   625.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

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

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.41
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.26
    HALFSTREET FLOOD WIDTH(FEET) =    5.47
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.23
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.36
  STREET FLOW TRAVEL TIME(MIN.) =   1.99   Tc(MIN.) =    9.03
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.613
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "2 DWELLINGS/ACRE"         C       0.65      0.25     0.700    50
  COMMERCIAL                 C       0.30      0.25     0.100    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.511
  SUBAREA AREA(ACRES) =    0.95      SUBAREA RUNOFF(CFS) =    1.27
  EFFECTIVE AREA(ACRES) =      2.12    AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.62
  TOTAL AREA(ACRES) =       2.1       PEAK FLOW RATE(CFS) =      2.78

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.27   HALFSTREET FLOOD WIDTH(FEET) =   6.03
  FLOW VELOCITY(FEET/SEC.) =  5.37   DEPTH*VELOCITY(FT*FT/SEC.) =   1.45
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =     920.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     22.00 TO NODE     23.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   385.00  DOWNSTREAM(FEET) =   374.00
  FLOW LENGTH(FEET) =   180.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.41
```

```
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       2.78
 PIPE TRAVEL TIME(MIN.) =   0.32    Tc(MIN.) =    9.35
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     23.00 =    1100.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     23.00 TO NODE     23.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    9.35
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.581
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                C        0.14      0.25      0.850    50
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 SUBAREA AREA(ACRES) =    0.14      SUBAREA RUNOFF(CFS) =    0.17
 EFFECTIVE AREA(ACRES) =      2.26   AREA-AVERAGED Fm(INCH/HR) =  0.16
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.63
 TOTAL AREA(ACRES) =        2.3       PEAK FLOW RATE(CFS) =       2.90

****************************************************************************
 FLOW PROCESS FROM NODE     23.00 TO NODE     25.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   374.00  DOWNSTREAM(FEET) =   371.00
 FLOW LENGTH(FEET) =    40.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  10.24
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       2.90
 PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    9.41
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     25.00 =    1140.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     25.00 TO NODE     25.00 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.) =    9.41
 RAINFALL INTENSITY(INCH/HR) =   1.57
 AREA-AVERAGED Fm(INCH/HR) =  0.16
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.63
 EFFECTIVE STREAM AREA(ACRES) =       2.26
 TOTAL STREAM AREA(ACRES) =       2.26
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.90

 ** CONFLUENCE DATA **
  STREAM       Q       Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       23.14   13.49    1.281  0.21( 0.15) 0.73      22.5      10.00
     2        2.90    9.41    1.575  0.25( 0.16) 0.63       2.3      20.00

 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       23.24    9.41    1.575  0.21( 0.15) 0.72      18.0      20.00
     2       25.44   13.49    1.281  0.21( 0.15) 0.72      24.8      10.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      25.44    Tc(MIN.) =    13.49
 EFFECTIVE AREA(ACRES) =      24.79   AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.72
 TOTAL AREA(ACRES) =       24.8
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     25.00 =    2705.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     25.00 TO NODE     26.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   371.00  DOWNSTREAM(FEET) =   367.00
 FLOW LENGTH(FEET) =   110.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  13.78
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      25.44
 PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =   13.62
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     26.00 =    2815.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     26.00 TO NODE     26.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   13.62
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.274
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       B        0.33      0.30      0.600    36
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       C        3.00      0.25      0.600    50
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA AREA(ACRES) =    3.33      SUBAREA RUNOFF(CFS) =    3.36
 EFFECTIVE AREA(ACRES) =     28.12   AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.71
```

```
 TOTAL AREA(ACRES) =       28.1       PEAK FLOW RATE(CFS) =      28.39

****************************************************************************
 FLOW PROCESS FROM NODE     26.00 TO NODE     27.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   367.00  DOWNSTREAM(FEET) =   347.00
 FLOW LENGTH(FEET) =   480.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  14.83
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      28.39
 PIPE TRAVEL TIME(MIN.) =   0.54    Tc(MIN.) =   14.16
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     27.00 =    3295.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     27.00 TO NODE     27.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   14.16
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.246
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       B        2.00      0.30     0.600    36
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       C        0.50      0.25     0.600    50
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       D        2.16      0.20     0.600    57
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA AREA(ACRES) =    4.66      SUBAREA RUNOFF(CFS) =    4.60
 EFFECTIVE AREA(ACRES) =     32.78   AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  0.69
 TOTAL AREA(ACRES) =       32.8       PEAK FLOW RATE(CFS) =      32.28

****************************************************************************
 FLOW PROCESS FROM NODE     27.00 TO NODE     37.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    347.00  DOWNSTREAM(FEET) =    345.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =    70.00   CHANNEL SLOPE =  0.0286
 CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   5.00
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.238
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                B        0.12      0.30     0.850    36
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      32.34
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   8.16
 AVERAGE FLOW DEPTH(FEET) =   0.37   TRAVEL TIME(MIN.) =   0.14
 Tc(MIN.) =   14.30
 SUBAREA AREA(ACRES) =     0.12       SUBAREA RUNOFF(CFS) =    0.11
 EFFECTIVE AREA(ACRES) =     32.90     AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =   0.22  AREA-AVERAGED Ap =   0.69
 TOTAL AREA(ACRES) =       32.9        PEAK FLOW RATE(CFS) =      32.28
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.37   FLOW VELOCITY(FEET/SEC.) =   8.15
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     37.00 =    3365.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     37.00 TO NODE     37.00 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.) =   14.30
 RAINFALL INTENSITY(INCH/HR) =   1.24
 AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.22
 AREA-AVERAGED Ap =  0.69
 EFFECTIVE STREAM AREA(ACRES) =      32.90
 TOTAL STREAM AREA(ACRES) =      32.90
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      32.28

****************************************************************************
 FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   275.00
 ELEVATION DATA: UPSTREAM(FEET) =    393.00  DOWNSTREAM(FEET) =    381.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.378
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.171
 SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                 D        0.12      0.20     0.100    57    5.38
 PUBLIC PARK                D        0.14      0.20     0.850    57    8.54
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.504
 SUBAREA RUNOFF(CFS) =      0.48
 TOTAL AREA(ACRES) =      0.26   PEAK FLOW RATE(CFS) =      0.48

****************************************************************************
 FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  51
----------------------------------------------------------------------------
```

```
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    381.00  DOWNSTREAM(FEET) =    374.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   200.00   CHANNEL SLOPE =  0.0350
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   5.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.985
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 B        0.07      0.30     0.100    36
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.55
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.67
 AVERAGE FLOW DEPTH(FEET) =   0.17   TRAVEL TIME(MIN.) =   0.91
 Tc(MIN.) =    6.29
 SUBAREA AREA(ACRES) =     0.07       SUBAREA RUNOFF(CFS) =    0.12
 EFFECTIVE AREA(ACRES) =      0.33     AREA-AVERAGED Fm(INCH/HR) =   0.09
 AREA-AVERAGED Fp(INCH/HR) =   0.21  AREA-AVERAGED Ap =   0.42
 TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       0.56

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.18   FLOW VELOCITY(FEET/SEC.) =   3.55
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =     475.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     32.00 TO NODE     33.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    374.00  DOWNSTREAM(FEET) =    371.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =    65.00   CHANNEL SLOPE =  0.0462
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   5.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.947
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 B        0.10      0.30     0.100    36
 PUBLIC PARK                B        0.84      0.30     0.850    36
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.770
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.29
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.05
 AVERAGE FLOW DEPTH(FEET) =   0.23   TRAVEL TIME(MIN.) =   0.21
 Tc(MIN.) =    6.50
 SUBAREA AREA(ACRES) =     0.94       SUBAREA RUNOFF(CFS) =    1.45
 EFFECTIVE AREA(ACRES) =      1.27     AREA-AVERAGED Fm(INCH/HR) =   0.19
 AREA-AVERAGED Fp(INCH/HR) =   0.28  AREA-AVERAGED Ap =   0.68
 TOTAL AREA(ACRES) =        1.3         PEAK FLOW RATE(CFS) =       2.00

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.27   FLOW VELOCITY(FEET/SEC.) =   5.50
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     33.00 =     540.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     33.00 TO NODE     34.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    371.00  DOWNSTREAM(FEET) =    367.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =    90.00   CHANNEL SLOPE =  0.0444
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   5.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.872
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                B        0.32      0.30     0.850    36
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.24
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.28
 AVERAGE FLOW DEPTH(FEET) =   0.37   TRAVEL TIME(MIN.) =   0.46
 Tc(MIN.) =    6.96
 SUBAREA AREA(ACRES) =     0.32       SUBAREA RUNOFF(CFS) =    0.47
 EFFECTIVE AREA(ACRES) =      1.59     AREA-AVERAGED Fm(INCH/HR) =   0.21
 AREA-AVERAGED Fp(INCH/HR) =   0.29  AREA-AVERAGED Ap =   0.71
 TOTAL AREA(ACRES) =        1.6         PEAK FLOW RATE(CFS) =       2.39

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.38   FLOW VELOCITY(FEET/SEC.) =   3.36
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     34.00 =     630.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     34.00 TO NODE     35.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    367.00  DOWNSTREAM(FEET) =    357.10
 CHANNEL LENGTH THRU SUBAREA(FEET) =   230.00   CHANNEL SLOPE =  0.0430
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   5.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.721
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                B        0.65      0.30     0.850    36
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.81
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.49
 AVERAGE FLOW DEPTH(FEET) =   0.40   TRAVEL TIME(MIN.) =   1.10
 Tc(MIN.) =    8.06
 SUBAREA AREA(ACRES) =     0.65       SUBAREA RUNOFF(CFS) =    0.86
 EFFECTIVE AREA(ACRES) =      2.24     AREA-AVERAGED Fm(INCH/HR) =   0.22
 AREA-AVERAGED Fp(INCH/HR) =   0.29  AREA-AVERAGED Ap =   0.75
```

```
 TOTAL AREA(ACRES) =        2.2        PEAK FLOW RATE(CFS) =      3.03

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.41   FLOW VELOCITY(FEET/SEC.) =   3.52
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     35.00 =     860.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     35.00 TO NODE     36.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   357.10  DOWNSTREAM(FEET) =   356.50
 FLOW LENGTH(FEET) =    75.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.65
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       3.03
 PIPE TRAVEL TIME(MIN.) =   0.27    Tc(MIN.) =    8.33
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     36.00 =     935.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     36.00 TO NODE     36.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    8.33
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.689
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                B       1.10      0.30     0.850    36
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 SUBAREA AREA(ACRES) =    1.10      SUBAREA RUNOFF(CFS) =    1.42
 EFFECTIVE AREA(ACRES) =      3.34   AREA-AVERAGED Fm(INCH/HR) =  0.23
 AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.78
 TOTAL AREA(ACRES) =        3.3       PEAK FLOW RATE(CFS) =      4.38

****************************************************************************
 FLOW PROCESS FROM NODE     36.00 TO NODE     37.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   356.50  DOWNSTREAM(FEET) =   345.00
 FLOW LENGTH(FEET) =    60.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  16.10
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       4.38
 PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    8.39
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     37.00 =     995.00 FEET.
```

```
****************************************************************************
 FLOW PROCESS FROM NODE     37.00 TO NODE     37.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.39
 RAINFALL INTENSITY(INCH/HR) =   1.68
 AREA-AVERAGED Fm(INCH/HR) =  0.23
 AREA-AVERAGED Fp(INCH/HR) =  0.30
 AREA-AVERAGED Ap =  0.78
 EFFECTIVE STREAM AREA(ACRES) =       3.34
 TOTAL STREAM AREA(ACRES) =       3.34
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.38

 ** CONFLUENCE DATA **
  STREAM       Q       Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       31.83   10.23     1.501  0.22( 0.15) 0.68      26.1      20.00
     1       32.28   14.30     1.238  0.22( 0.15) 0.69      32.9      10.00
     2        4.38    8.39     1.682  0.30( 0.23) 0.78       3.3      30.00

 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       33.98    8.39     1.682  0.23( 0.16) 0.70      24.7      30.00
     2       35.66   10.23     1.501  0.23( 0.16) 0.69      29.4      20.00
     3       35.32   14.30     1.238  0.23( 0.16) 0.70      36.2      10.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      35.66    Tc(MIN.) =     10.23
 EFFECTIVE AREA(ACRES) =      29.43   AREA-AVERAGED Fm(INCH/HR) =  0.16
 AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap =  0.69
 TOTAL AREA(ACRES) =       36.2
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     37.00 =    3365.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     37.00 TO NODE     45.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    345.00  DOWNSTREAM(FEET) =    339.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   275.00   CHANNEL SLOPE =  0.0218
 CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   5.00
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.453
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                B       0.41      0.30     0.850    36
```

```
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      35.88
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   7.79
 AVERAGE FLOW DEPTH(FEET) =   0.42   TRAVEL TIME(MIN.) =   0.59
 Tc(MIN.) =   10.82
 SUBAREA AREA(ACRES) =     0.41       SUBAREA RUNOFF(CFS) =    0.44
 EFFECTIVE AREA(ACRES) =     29.84     AREA-AVERAGED Fm(INCH/HR) =   0.16
 AREA-AVERAGED Fp(INCH/HR) =   0.23  AREA-AVERAGED Ap =   0.70
 TOTAL AREA(ACRES) =       36.6         PEAK FLOW RATE(CFS) =      35.66
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.42   FLOW VELOCITY(FEET/SEC.) =   7.75
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     45.00 =    3640.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     45.00 TO NODE     45.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   10.82
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.453
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp        Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 B       0.22      0.30     0.100    36
 PUBLIC PARK                B       0.26      0.30     0.850    36
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.506
 SUBAREA AREA(ACRES) =    0.48      SUBAREA RUNOFF(CFS) =    0.56
 EFFECTIVE AREA(ACRES) =     30.32   AREA-AVERAGED Fm(INCH/HR) =  0.16
 AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap =  0.69
 TOTAL AREA(ACRES) =       37.1       PEAK FLOW RATE(CFS) =      35.66
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =       37.1  TC(MIN.) =     10.82
 EFFECTIVE AREA(ACRES) =     30.32  AREA-AVERAGED Fm(INCH/HR)=  0.16
 AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap = 0.693
 PEAK FLOW RATE(CFS)   =      35.66

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       33.98    8.99    1.617  0.24( 0.16) 0.70      25.6      30.00
     2       35.66   10.82    1.453  0.23( 0.16) 0.69      30.3      20.00
     3       35.32   14.89    1.210  0.23( 0.16) 0.70      37.1      10.00
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

B. 25-YEAR STORM

```
****************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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                           Analysis prepared by:

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 ************************* DESCRIPTION OF STUDY *************************
* Hydrology Study for Crawford Park                                        *
* Proposed Condition                                                       *
* 25-year Storm                                                            *
 **************************************************************************

  FILE NAME: CPPR.DAT
  TIME/DATE OF STUDY: 15:45 11/14/2020
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   280.00
  ELEVATION DATA: UPSTREAM(FEET) =    915.00  DOWNSTREAM(FEET) =    750.00
```

```
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.475
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.842
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"               C        1.19      0.25     1.000    77    7.47
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      3.85
  TOTAL AREA(ACRES) =      1.19   PEAK FLOW RATE(CFS) =      3.85

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    750.00  DOWNSTREAM(FEET) =    600.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   325.00   CHANNEL SLOPE =  0.4615
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =      3.85
  FLOW VELOCITY(FEET/SEC) =   6.28 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.86   Tc(MIN.) =    8.34
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     605.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.34
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.612
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"               C        0.90      0.25     1.000    77
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        0.24      0.20     1.000    83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.24
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    1.14      SUBAREA RUNOFF(CFS) =    3.46
  EFFECTIVE AREA(ACRES) =      2.33   AREA-AVERAGED Fm(INCH/HR) =  0.24
  AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       2.3       PEAK FLOW RATE(CFS) =      7.06

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  600.00  DOWNSTREAM ELEVATION(FEET) =  503.00
```

```
STREET LENGTH(FEET) =   730.00   CURB HEIGHT(INCHES) =  8.0
STREET HALFWIDTH(FEET) = 30.00

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

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

  **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     11.97
  STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
  STREET FLOW DEPTH(FEET) =  0.31
  HALFSTREET FLOOD WIDTH(FEET) =    8.28
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    7.42
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    2.30
STREET FLOW TRAVEL TIME(MIN.) =   1.64   Tc(MIN.) =    9.98
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.263
SUBAREA LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
RESIDENTIAL
"2 DWELLINGS/ACRE"         D        3.49      0.20     0.700    75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
SUBAREA AREA(ACRES) =    3.49      SUBAREA RUNOFF(CFS) =    9.81
EFFECTIVE AREA(ACRES) =      5.82    AREA-AVERAGED Fm(INCH/HR) =  0.18
AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  0.82
TOTAL AREA(ACRES) =        5.8        PEAK FLOW RATE(CFS) =      16.14

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =   9.66
FLOW VELOCITY(FEET/SEC.) =  7.86   DEPTH*VELOCITY(FT*FT/SEC.) =   2.63
LONGEST FLOWPATH FROM NODE     10.00 TO NODE     13.00 =    1335.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     13.00 TO NODE     14.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  503.00  DOWNSTREAM ELEVATION(FEET) =  395.00
 STREET LENGTH(FEET) =  1085.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

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

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

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     23.36
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.38
   HALFSTREET FLOOD WIDTH(FEET) =   12.23
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    7.64
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    2.91
 STREET FLOW TRAVEL TIME(MIN.) =   2.37   Tc(MIN.) =   12.34
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.892
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "2 DWELLINGS/ACRE"         D        5.82      0.20     0.700    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
 SUBAREA AREA(ACRES) =    5.82      SUBAREA RUNOFF(CFS) =   14.42
 EFFECTIVE AREA(ACRES) =     11.64    AREA-AVERAGED Fm(INCH/HR) =  0.16
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.76
 TOTAL AREA(ACRES) =       11.6        PEAK FLOW RATE(CFS) =      28.61

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.40   HALFSTREET FLOOD WIDTH(FEET) =  13.40
 FLOW VELOCITY(FEET/SEC.) =  7.96   DEPTH*VELOCITY(FT*FT/SEC.) =   3.20
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     14.00 =    2420.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     14.00 TO NODE     15.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   395.00  DOWNSTREAM(FEET) =   394.00
 FLOW LENGTH(FEET) =    45.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  11.79
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      28.61
 PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =   12.41
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     15.00 =    2465.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   12.41
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.884
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "2 DWELLINGS/ACRE"         D       10.89      0.20     0.700    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
 SUBAREA AREA(ACRES) =   10.89      SUBAREA RUNOFF(CFS) =   26.89
 EFFECTIVE AREA(ACRES) =     22.53   AREA-AVERAGED Fm(INCH/HR) =  0.15
```

```
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.73
 TOTAL AREA(ACRES) =       22.5      PEAK FLOW RATE(CFS) =      55.42

****************************************************************************
 FLOW PROCESS FROM NODE     15.00 TO NODE     25.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   394.00  DOWNSTREAM(FEET) =   371.00
 FLOW LENGTH(FEET) =   240.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  16.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  24.20
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      55.42
 PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =   12.57
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     25.00 =    2705.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     25.00 TO NODE     25.00 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.) =   12.57
 RAINFALL INTENSITY(INCH/HR) =   2.86
 AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.21
 AREA-AVERAGED Ap =  0.73
 EFFECTIVE STREAM AREA(ACRES) =      22.53
 TOTAL STREAM AREA(ACRES) =      22.53
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      55.42

****************************************************************************
 FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   295.00
 ELEVATION DATA: UPSTREAM(FEET) =    460.00  DOWNSTREAM(FEET) =    436.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.036
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.976
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 "2 DWELLINGS/ACRE"         C       1.17      0.25     0.700    69    7.04
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
 SUBAREA RUNOFF(CFS) =      4.00
 TOTAL AREA(ACRES) =      1.17   PEAK FLOW RATE(CFS) =      4.00

****************************************************************************
 FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  436.00  DOWNSTREAM ELEVATION(FEET) =  385.00
 STREET LENGTH(FEET) =   625.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

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

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

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.45
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.32
   HALFSTREET FLOOD WIDTH(FEET) =    8.97
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.97
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.93
 STREET FLOW TRAVEL TIME(MIN.) =   1.74   Tc(MIN.) =    8.78
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.507
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "2 DWELLINGS/ACRE"         C       0.65      0.25     0.700    69
 COMMERCIAL                 C       0.30      0.25     0.100    69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.511
 SUBAREA AREA(ACRES) =    0.95      SUBAREA RUNOFF(CFS) =    2.89
 EFFECTIVE AREA(ACRES) =      2.12    AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.62
 TOTAL AREA(ACRES) =       2.1       PEAK FLOW RATE(CFS) =      6.40

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =   9.72
 FLOW VELOCITY(FEET/SEC.) =  6.17   DEPTH*VELOCITY(FT*FT/SEC.) =   2.07
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =     920.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     22.00 TO NODE     23.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   385.00  DOWNSTREAM(FEET) =   374.00
 FLOW LENGTH(FEET) =   180.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  11.94
```

```
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.40
  PIPE TRAVEL TIME(MIN.) =   0.25    Tc(MIN.) =    9.03
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     23.00 =    1100.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     23.00 TO NODE     23.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.03
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.452
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                C        0.14      0.25     0.850    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =    0.14      SUBAREA RUNOFF(CFS) =    0.41
  EFFECTIVE AREA(ACRES) =      2.26   AREA-AVERAGED Fm(INCH/HR) =  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.63
  TOTAL AREA(ACRES) =        2.3       PEAK FLOW RATE(CFS) =       6.70

****************************************************************************
  FLOW PROCESS FROM NODE     23.00 TO NODE     25.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   374.00  DOWNSTREAM(FEET) =   371.00
  FLOW LENGTH(FEET) =    40.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.02
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.70
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    9.08
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     25.00 =    1140.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     25.00 TO NODE     25.00 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.) =    9.08
  RAINFALL INTENSITY(INCH/HR) =   3.44
  AREA-AVERAGED Fm(INCH/HR) =  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.63
  EFFECTIVE STREAM AREA(ACRES) =       2.26
  TOTAL STREAM AREA(ACRES) =       2.26
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.70

  ** CONFLUENCE DATA **
   STREAM       Q       Tc   Intensity   Fp(Fm)     Ap     Ae    HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       55.42   12.57    2.862  0.21( 0.15) 0.73      22.5      10.00
      2        6.70    9.08    3.441  0.25( 0.16) 0.63       2.3      20.00

  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       55.27    9.08    3.441  0.21( 0.15) 0.72      18.5      20.00
      2       60.94   12.57    2.862  0.21( 0.15) 0.72      24.8      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      60.94    Tc(MIN.) =    12.57
  EFFECTIVE AREA(ACRES) =      24.79   AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.72
  TOTAL AREA(ACRES) =       24.8
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     25.00 =    2705.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     25.00 TO NODE     26.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   371.00  DOWNSTREAM(FEET) =   367.00
  FLOW LENGTH(FEET) =   110.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  20.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.25
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      60.94
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =   12.68
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     26.00 =    2815.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     26.00 TO NODE     26.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.68
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.849
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       B        0.33      0.30     0.600    56
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       C        3.00      0.25     0.600    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA AREA(ACRES) =    3.33      SUBAREA RUNOFF(CFS) =    8.08
  EFFECTIVE AREA(ACRES) =     28.12   AREA-AVERAGED Fm(INCH/HR) =  0.15
  AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.71
```

```
 TOTAL AREA(ACRES) =       28.1       PEAK FLOW RATE(CFS) =      68.26

****************************************************************************
 FLOW PROCESS FROM NODE     26.00 TO NODE     27.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   367.00  DOWNSTREAM(FEET) =   347.00
 FLOW LENGTH(FEET) =   480.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  30.0 INCH PIPE IS  21.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  18.61
 ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      68.26
 PIPE TRAVEL TIME(MIN.) =   0.43    Tc(MIN.) =   13.11
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     27.00 =    3295.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     27.00 TO NODE     27.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   13.11
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.795
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       B        2.00      0.30     0.600    56
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       C        0.50      0.25     0.600    69
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       D        2.16      0.20     0.600    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA AREA(ACRES) =    4.66      SUBAREA RUNOFF(CFS) =    11.10
 EFFECTIVE AREA(ACRES) =     32.78   AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  0.69
 TOTAL AREA(ACRES) =       32.8       PEAK FLOW RATE(CFS) =      78.01

****************************************************************************
 FLOW PROCESS FROM NODE     27.00 TO NODE     37.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    347.00  DOWNSTREAM(FEET) =    345.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =     70.00   CHANNEL SLOPE =  0.0286
 CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   5.00
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.783
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                B        0.12      0.30     0.850    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
```

```
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      78.15
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  11.20
 AVERAGE FLOW DEPTH(FEET) =   0.62   TRAVEL TIME(MIN.) =   0.10
 Tc(MIN.) =   13.21
 SUBAREA AREA(ACRES) =     0.12       SUBAREA RUNOFF(CFS) =    0.27
 EFFECTIVE AREA(ACRES) =     32.90     AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =   0.22  AREA-AVERAGED Ap =   0.69
 TOTAL AREA(ACRES) =       32.9        PEAK FLOW RATE(CFS) =      78.01
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.62   FLOW VELOCITY(FEET/SEC.) =  11.18
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     37.00 =    3365.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     37.00 TO NODE     37.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   13.21
 RAINFALL INTENSITY(INCH/HR) =   2.78
 AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.22
 AREA-AVERAGED Ap =  0.69
 EFFECTIVE STREAM AREA(ACRES) =      32.90
 TOTAL STREAM AREA(ACRES) =      32.90
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      78.01

****************************************************************************
 FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   275.00
 ELEVATION DATA: UPSTREAM(FEET) =    393.00  DOWNSTREAM(FEET) =    381.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.378
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.629
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                 D        0.12      0.20     0.100    75    5.38
 PUBLIC PARK                D        0.14      0.20     0.850    75    8.54
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.504
 SUBAREA RUNOFF(CFS) =      1.06
 TOTAL AREA(ACRES) =      0.26   PEAK FLOW RATE(CFS) =      1.06

****************************************************************************
 FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  51
----------------------------------------------------------------------------
```

```
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    381.00  DOWNSTREAM(FEET) =    374.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   200.00   CHANNEL SLOPE =  0.0350
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   5.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.294
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 B        0.07      0.30     0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.19
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.37
 AVERAGE FLOW DEPTH(FEET) =   0.23   TRAVEL TIME(MIN.) =   0.76
 Tc(MIN.) =    6.14
 SUBAREA AREA(ACRES) =     0.07       SUBAREA RUNOFF(CFS) =    0.27
 EFFECTIVE AREA(ACRES) =      0.33     AREA-AVERAGED Fm(INCH/HR) =   0.09
 AREA-AVERAGED Fp(INCH/HR) =   0.21  AREA-AVERAGED Ap =   0.42
 TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       1.25

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.24   FLOW VELOCITY(FEET/SEC.) =   4.36
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =     475.00 FEET.

******************************************************************************
 FLOW PROCESS FROM NODE     32.00 TO NODE     33.00 IS CODE =  51
------------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    374.00  DOWNSTREAM(FEET) =    371.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =    65.00   CHANNEL SLOPE =  0.0462
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   5.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.226
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 B        0.10      0.30     0.100    56
 PUBLIC PARK                B        0.84      0.30     0.850    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.770
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.94
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.12
 AVERAGE FLOW DEPTH(FEET) =   0.31   TRAVEL TIME(MIN.) =   0.18
 Tc(MIN.) =    6.32
 SUBAREA AREA(ACRES) =     0.94       SUBAREA RUNOFF(CFS) =    3.38
 EFFECTIVE AREA(ACRES) =      1.27     AREA-AVERAGED Fm(INCH/HR) =   0.19
 AREA-AVERAGED Fp(INCH/HR) =   0.28  AREA-AVERAGED Ap =   0.68
 TOTAL AREA(ACRES) =        1.3         PEAK FLOW RATE(CFS) =       4.61

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.37   FLOW VELOCITY(FEET/SEC.) =   6.77
```

```
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     33.00 =     540.00 FEET.

******************************************************************************
 FLOW PROCESS FROM NODE     33.00 TO NODE     34.00 IS CODE =  51
------------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    371.00  DOWNSTREAM(FEET) =    367.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =    90.00   CHANNEL SLOPE =  0.0444
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   5.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.094
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                B        0.32      0.30     0.850    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.16
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.12
 AVERAGE FLOW DEPTH(FEET) =   0.50   TRAVEL TIME(MIN.) =   0.36
 Tc(MIN.) =    6.68
 SUBAREA AREA(ACRES) =     0.32       SUBAREA RUNOFF(CFS) =    1.11
 EFFECTIVE AREA(ACRES) =      1.59     AREA-AVERAGED Fm(INCH/HR) =   0.21
 AREA-AVERAGED Fp(INCH/HR) =   0.29  AREA-AVERAGED Ap =   0.71
 TOTAL AREA(ACRES) =        1.6         PEAK FLOW RATE(CFS) =       5.56

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.52   FLOW VELOCITY(FEET/SEC.) =   4.18
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     34.00 =     630.00 FEET.

******************************************************************************
 FLOW PROCESS FROM NODE     34.00 TO NODE     35.00 IS CODE =  51
------------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    367.00  DOWNSTREAM(FEET) =    357.10
 CHANNEL LENGTH THRU SUBAREA(FEET) =   230.00   CHANNEL SLOPE =  0.0430
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   5.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.814
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                B        0.65      0.30     0.850    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.61
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.30
 AVERAGE FLOW DEPTH(FEET) =   0.55   TRAVEL TIME(MIN.) =   0.89
 Tc(MIN.) =    7.57
 SUBAREA AREA(ACRES) =     0.65       SUBAREA RUNOFF(CFS) =    2.08
 EFFECTIVE AREA(ACRES) =      2.24     AREA-AVERAGED Fm(INCH/HR) =   0.22
 AREA-AVERAGED Fp(INCH/HR) =   0.29  AREA-AVERAGED Ap =   0.75
```

```
 TOTAL AREA(ACRES) =       2.2        PEAK FLOW RATE(CFS) =      7.25

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.58   FLOW VELOCITY(FEET/SEC.) =   4.38
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     35.00 =     860.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     35.00 TO NODE     36.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   357.10  DOWNSTREAM(FEET) =   356.50
 FLOW LENGTH(FEET) =    75.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.74
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      7.25
 PIPE TRAVEL TIME(MIN.) =   0.22    Tc(MIN.) =    7.79
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     36.00 =     935.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     36.00 TO NODE     36.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    7.79
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.753
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                B       1.10      0.30     0.850    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 SUBAREA AREA(ACRES) =    1.10     SUBAREA RUNOFF(CFS) =    3.46
 EFFECTIVE AREA(ACRES) =      3.34   AREA-AVERAGED Fm(INCH/HR) =  0.23
 AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.78
 TOTAL AREA(ACRES) =       3.3      PEAK FLOW RATE(CFS) =     10.59

****************************************************************************
 FLOW PROCESS FROM NODE     36.00 TO NODE     37.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   356.50  DOWNSTREAM(FEET) =   345.00
 FLOW LENGTH(FEET) =    60.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  20.76
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     10.59
 PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    7.84
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     37.00 =     995.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     37.00 TO NODE     37.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    7.84
 RAINFALL INTENSITY(INCH/HR) =   3.74
 AREA-AVERAGED Fm(INCH/HR) =  0.23
 AREA-AVERAGED Fp(INCH/HR) =  0.30
 AREA-AVERAGED Ap =  0.78
 EFFECTIVE STREAM AREA(ACRES) =       3.34
 TOTAL STREAM AREA(ACRES) =       3.34
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      10.59

 ** CONFLUENCE DATA **
  STREAM      Q      Tc   Intensity   Fp(Fm)     Ap     Ae    HEADWATER
  NUMBER    (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)   NODE
     1      75.86    9.73    3.309  0.22( 0.15) 0.68      26.6      20.00
     1      78.01   13.21    2.783  0.22( 0.15) 0.69      32.9      10.00
     2      10.59    7.84    3.740  0.30( 0.23) 0.78       3.3      30.00

 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      80.02    7.84    3.740  0.23( 0.16) 0.70      24.8      30.00
     2      85.14    9.73    3.309  0.23( 0.16) 0.69      30.0      20.00
     3      85.71   13.21    2.783  0.23( 0.16) 0.70      36.2      10.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      85.71    Tc(MIN.) =     13.21
 EFFECTIVE AREA(ACRES) =      36.24   AREA-AVERAGED Fm(INCH/HR) =  0.16
 AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap =  0.70
 TOTAL AREA(ACRES) =      36.2
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     37.00 =    3365.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     37.00 TO NODE     45.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    345.00  DOWNSTREAM(FEET) =    339.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   275.00   CHANNEL SLOPE =  0.0218
 CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   5.00
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.733
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                B       0.41      0.30     0.850    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
```

```
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      86.17
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  10.59
  AVERAGE FLOW DEPTH(FEET) =   0.71   TRAVEL TIME(MIN.) =   0.43
  Tc(MIN.) =   13.65
  SUBAREA AREA(ACRES) =     0.41       SUBAREA RUNOFF(CFS) =    0.91
  EFFECTIVE AREA(ACRES) =     36.65     AREA-AVERAGED Fm(INCH/HR) =   0.16
  AREA-AVERAGED Fp(INCH/HR) =   0.23  AREA-AVERAGED Ap =   0.70
  TOTAL AREA(ACRES) =       36.6         PEAK FLOW RATE(CFS) =      85.71
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.71   FLOW VELOCITY(FEET/SEC.) =  10.63
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     45.00 =    3640.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     45.00 TO NODE     45.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   13.65
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.733
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 B        0.22      0.30     0.100    56
  PUBLIC PARK                B        0.26      0.30     0.850    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.506
  SUBAREA AREA(ACRES) =    0.48      SUBAREA RUNOFF(CFS) =    1.11
  EFFECTIVE AREA(ACRES) =     37.13   AREA-AVERAGED Fm(INCH/HR) =  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap =  0.70
  TOTAL AREA(ACRES) =       37.1       PEAK FLOW RATE(CFS) =      85.97
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       37.1  TC(MIN.) =     13.65
  EFFECTIVE AREA(ACRES) =     37.13  AREA-AVERAGED Fm(INCH/HR)=  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap = 0.700
  PEAK FLOW RATE(CFS)   =      85.97

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1      80.03    8.28    3.626  0.24( 0.16) 0.70      25.7      30.00
      2      85.21   10.16    3.228  0.23( 0.16) 0.69      30.9      20.00
      3      85.97   13.65    2.733  0.23( 0.16) 0.70      37.1      10.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

C. 100-YEAR STORM

```
****************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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 ************************** DESCRIPTION OF STUDY **************************
* Hydrology Study for Crawford Park                                        *
* Proposed Condition                                                       *
* 100-year Storm                                                           *
 **************************************************************************

  FILE NAME: CPPR.DAT
  TIME/DATE OF STUDY: 15:45 11/14/2020
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
                  --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   280.00
  ELEVATION DATA: UPSTREAM(FEET) =    915.00  DOWNSTREAM(FEET) =    750.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.475
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.914
  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 FAIR COVER
  "OPEN BRUSH"               C        1.19      0.25     1.000    92    7.47
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      5.00
  TOTAL AREA(ACRES) =      1.19   PEAK FLOW RATE(CFS) =      5.00

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    750.00  DOWNSTREAM(FEET) =    600.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   325.00   CHANNEL SLOPE =  0.4615
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =      5.00
  FLOW VELOCITY(FEET/SEC) =   6.67 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.81   Tc(MIN.) =    8.29
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     605.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.29
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.632
  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
  "OPEN BRUSH"               C        0.90      0.25     1.000    92
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        0.24      0.20     1.000    96
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.24
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    1.14      SUBAREA RUNOFF(CFS) =    4.51
  EFFECTIVE AREA(ACRES) =      2.33   AREA-AVERAGED Fm(INCH/HR) =  0.24
  AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =        2.3       PEAK FLOW RATE(CFS) =       9.20

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  600.00  DOWNSTREAM ELEVATION(FEET) =  503.00
```

```
 STREET LENGTH(FEET) =   730.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

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

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

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      15.58
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.33
   HALFSTREET FLOOD WIDTH(FEET) =    9.47
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    7.83
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    2.60
 STREET FLOW TRAVEL TIME(MIN.) =   1.55   Tc(MIN.) =    9.84
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.198
 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"         D        3.49      0.20     0.700    91
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
 SUBAREA AREA(ACRES) =    3.49      SUBAREA RUNOFF(CFS) =   12.75
 EFFECTIVE AREA(ACRES) =      5.82    AREA-AVERAGED Fm(INCH/HR) =  0.18
 AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  0.82
 TOTAL AREA(ACRES) =        5.8        PEAK FLOW RATE(CFS) =      21.03

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  10.90
 FLOW VELOCITY(FEET/SEC.) =  8.38   DEPTH*VELOCITY(FT*FT/SEC.) =   2.99
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     13.00 =    1335.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     13.00 TO NODE     14.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  503.00  DOWNSTREAM ELEVATION(FEET) =  395.00
 STREET LENGTH(FEET) =  1085.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

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

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

```
   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      30.46
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.41
   HALFSTREET FLOOD WIDTH(FEET) =   13.71
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    8.13
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    3.31
 STREET FLOW TRAVEL TIME(MIN.) =   2.22   Tc(MIN.) =   12.06
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.735
 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"         D        5.82      0.20     0.700    91
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
 SUBAREA AREA(ACRES) =    5.82      SUBAREA RUNOFF(CFS) =   18.83
 EFFECTIVE AREA(ACRES) =     11.64    AREA-AVERAGED Fm(INCH/HR) =  0.16
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.76
 TOTAL AREA(ACRES) =       11.6        PEAK FLOW RATE(CFS) =      37.44

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.43   HALFSTREET FLOOD WIDTH(FEET) =  14.96
 FLOW VELOCITY(FEET/SEC.) =  8.54   DEPTH*VELOCITY(FT*FT/SEC.) =   3.67
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     14.00 =    2420.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     14.00 TO NODE     15.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   395.00  DOWNSTREAM(FEET) =   394.00
 FLOW LENGTH(FEET) =    45.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.66
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      37.44
 PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =   12.12
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     15.00 =    2465.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   12.12
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.725
 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"         D       10.89      0.20     0.700    91
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
 SUBAREA AREA(ACRES) =   10.89      SUBAREA RUNOFF(CFS) =   35.13
 EFFECTIVE AREA(ACRES) =     22.53   AREA-AVERAGED Fm(INCH/HR) =  0.15
```

```
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.73
 TOTAL AREA(ACRES) =       22.5      PEAK FLOW RATE(CFS) =      72.47

****************************************************************************
 FLOW PROCESS FROM NODE     15.00 TO NODE     25.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   394.00  DOWNSTREAM(FEET) =   371.00
 FLOW LENGTH(FEET) =   240.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  17.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  25.96
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      72.47
 PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =   12.28
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     25.00 =    2705.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     25.00 TO NODE     25.00 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.) =   12.28
 RAINFALL INTENSITY(INCH/HR) =   3.70
 AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.21
 AREA-AVERAGED Ap =  0.73
 EFFECTIVE STREAM AREA(ACRES) =      22.53
 TOTAL STREAM AREA(ACRES) =      22.53
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      72.47

****************************************************************************
 FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   295.00
 ELEVATION DATA: UPSTREAM(FEET) =    460.00  DOWNSTREAM(FEET) =    436.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.036
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.087
 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
 "2 DWELLINGS/ACRE"         C       1.17      0.25     0.700    86    7.04
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
 SUBAREA RUNOFF(CFS) =      5.17
 TOTAL AREA(ACRES) =      1.17   PEAK FLOW RATE(CFS) =      5.17

****************************************************************************
 FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  436.00  DOWNSTREAM ELEVATION(FEET) =  385.00
 STREET LENGTH(FEET) =   625.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

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

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

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.05
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.34
   HALFSTREET FLOOD WIDTH(FEET) =   10.12
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    6.36
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    2.18
 STREET FLOW TRAVEL TIME(MIN.) =   1.64   Tc(MIN.) =    8.67
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.513
 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"         C       0.65      0.25     0.700    86
 COMMERCIAL                 C       0.30      0.25     0.100    86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.511
 SUBAREA AREA(ACRES) =    0.95      SUBAREA RUNOFF(CFS) =    3.75
 EFFECTIVE AREA(ACRES) =      2.12    AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.62
 TOTAL AREA(ACRES) =       2.1       PEAK FLOW RATE(CFS) =      8.32

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  10.98
 FLOW VELOCITY(FEET/SEC.) =  6.55   DEPTH*VELOCITY(FT*FT/SEC.) =   2.35
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =     920.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     22.00 TO NODE     23.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   385.00  DOWNSTREAM(FEET) =   374.00
 FLOW LENGTH(FEET) =   180.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.83
```

```
ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =       8.32
PIPE TRAVEL TIME(MIN.) =   0.23    Tc(MIN.) =    8.91
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     23.00 =    1100.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     23.00 TO NODE     23.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
MAINLINE Tc(MIN.) =    8.91
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.444
SUBAREA LOSS RATE DATA(AMC III):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
PUBLIC PARK                C        0.14      0.25      0.850    86
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
SUBAREA AREA(ACRES) =    0.14      SUBAREA RUNOFF(CFS) =    0.53
EFFECTIVE AREA(ACRES) =      2.26   AREA-AVERAGED Fm(INCH/HR) =  0.16
AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.63
TOTAL AREA(ACRES) =        2.3       PEAK FLOW RATE(CFS) =       8.72

****************************************************************************
FLOW PROCESS FROM NODE     23.00 TO NODE     25.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   374.00  DOWNSTREAM(FEET) =   371.00
FLOW LENGTH(FEET) =    40.00   MANNING'S N =  0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =  14.00
ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =       8.72
PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    8.95
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     25.00 =    1140.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     25.00 TO NODE     25.00 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =    8.95
RAINFALL INTENSITY(INCH/HR) =   4.43
AREA-AVERAGED Fm(INCH/HR) =  0.16
AREA-AVERAGED Fp(INCH/HR) =  0.25
AREA-AVERAGED Ap =  0.63
EFFECTIVE STREAM AREA(ACRES) =       2.26
TOTAL STREAM AREA(ACRES) =       2.26
PEAK FLOW RATE(CFS) AT CONFLUENCE =       8.72
```

```
** CONFLUENCE DATA **
 STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
    1       72.47   12.28    3.698  0.21( 0.15) 0.73      22.5      10.00
    2        8.72    8.95    4.431  0.25( 0.16) 0.63       2.3      20.00

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       72.50    8.95    4.431  0.21( 0.15) 0.72      18.7      20.00
    2       79.69   12.28    3.698  0.21( 0.15) 0.72      24.8      10.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      79.69    Tc(MIN.) =    12.28
EFFECTIVE AREA(ACRES) =      24.79   AREA-AVERAGED Fm(INCH/HR) =  0.15
AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.72
TOTAL AREA(ACRES) =       24.8
LONGEST FLOWPATH FROM NODE     10.00 TO NODE     25.00 =    2705.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     25.00 TO NODE     26.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   371.00  DOWNSTREAM(FEET) =   367.00
FLOW LENGTH(FEET) =   110.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  33.0 INCH PIPE IS  22.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =  18.43
ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =      79.69
PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =   12.38
LONGEST FLOWPATH FROM NODE     10.00 TO NODE     26.00 =    2815.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     26.00 TO NODE     26.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
MAINLINE Tc(MIN.) =   12.38
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.681
SUBAREA LOSS RATE DATA(AMC III):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
RESIDENTIAL
"3-4 DWELLINGS/ACRE"       B        0.33      0.30     0.600    76
RESIDENTIAL
"3-4 DWELLINGS/ACRE"       C        3.00      0.25     0.600    86
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
SUBAREA AREA(ACRES) =    3.33      SUBAREA RUNOFF(CFS) =   10.57
EFFECTIVE AREA(ACRES) =     28.12   AREA-AVERAGED Fm(INCH/HR) =  0.15
AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.71
```

```
 TOTAL AREA(ACRES) =       28.1       PEAK FLOW RATE(CFS) =      89.32

****************************************************************************
 FLOW PROCESS FROM NODE     26.00 TO NODE     27.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   367.00  DOWNSTREAM(FEET) =   347.00
 FLOW LENGTH(FEET) =   480.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  33.0 INCH PIPE IS  23.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  19.88
 ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      89.32
 PIPE TRAVEL TIME(MIN.) =   0.40    Tc(MIN.) =   12.78
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     27.00 =    3295.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     27.00 TO NODE     27.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   12.78
 * 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
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       B        2.00      0.30     0.600    76
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       C        0.50      0.25     0.600    86
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       D        2.16      0.20     0.600    91
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA AREA(ACRES) =    4.66      SUBAREA RUNOFF(CFS) =   14.53
 EFFECTIVE AREA(ACRES) =     32.78   AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  0.69
 TOTAL AREA(ACRES) =       32.8       PEAK FLOW RATE(CFS) =     102.16

****************************************************************************
 FLOW PROCESS FROM NODE     27.00 TO NODE     37.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    347.00  DOWNSTREAM(FEET) =    345.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =    70.00   CHANNEL SLOPE =  0.0286
 CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   5.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.599
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                B        0.12      0.30     0.850    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     102.34
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  12.28
 AVERAGE FLOW DEPTH(FEET) =   0.73   TRAVEL TIME(MIN.) =   0.10
 Tc(MIN.) =   12.87
 SUBAREA AREA(ACRES) =     0.12       SUBAREA RUNOFF(CFS) =    0.36
 EFFECTIVE AREA(ACRES) =     32.90     AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =   0.22  AREA-AVERAGED Ap =   0.69
 TOTAL AREA(ACRES) =       32.9         PEAK FLOW RATE(CFS) =     102.16
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.73   FLOW VELOCITY(FEET/SEC.) =  12.26
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     37.00 =    3365.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     37.00 TO NODE     37.00 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.) =   12.87
 RAINFALL INTENSITY(INCH/HR) =   3.60
 AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.22
 AREA-AVERAGED Ap =  0.69
 EFFECTIVE STREAM AREA(ACRES) =      32.90
 TOTAL STREAM AREA(ACRES) =      32.90
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     102.16

****************************************************************************
 FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   275.00
 ELEVATION DATA: UPSTREAM(FEET) =    393.00  DOWNSTREAM(FEET) =    381.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.378
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.934
 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                 D        0.12      0.20     0.100    91    5.38
 PUBLIC PARK                D        0.14      0.20     0.850    91    8.54
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.504
 SUBAREA RUNOFF(CFS) =      1.36
 TOTAL AREA(ACRES) =      0.26   PEAK FLOW RATE(CFS) =      1.36

****************************************************************************
 FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  51
----------------------------------------------------------------------------
```

```
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    381.00  DOWNSTREAM(FEET) =    374.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   200.00   CHANNEL SLOPE =  0.0350
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   5.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.525
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 B        0.07      0.30     0.100    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.54
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.67
 AVERAGE FLOW DEPTH(FEET) =   0.26   TRAVEL TIME(MIN.) =   0.71
 Tc(MIN.) =    6.09
 SUBAREA AREA(ACRES) =     0.07       SUBAREA RUNOFF(CFS) =    0.35
 EFFECTIVE AREA(ACRES) =      0.33     AREA-AVERAGED Fm(INCH/HR) =   0.09
 AREA-AVERAGED Fp(INCH/HR) =   0.21  AREA-AVERAGED Ap =   0.42
 TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       1.62

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.26   FLOW VELOCITY(FEET/SEC.) =   4.70
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =     475.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     32.00 TO NODE     33.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    374.00  DOWNSTREAM(FEET) =    371.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =    65.00   CHANNEL SLOPE =  0.0462
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   5.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.442
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 B        0.10      0.30     0.100    76
 PUBLIC PARK                B        0.84      0.30     0.850    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.770
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.82
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.59
 AVERAGE FLOW DEPTH(FEET) =   0.34   TRAVEL TIME(MIN.) =   0.16
 Tc(MIN.) =    6.26
 SUBAREA AREA(ACRES) =     0.94       SUBAREA RUNOFF(CFS) =    4.41
 EFFECTIVE AREA(ACRES) =      1.27     AREA-AVERAGED Fm(INCH/HR) =   0.19
 AREA-AVERAGED Fp(INCH/HR) =   0.28  AREA-AVERAGED Ap =   0.68
 TOTAL AREA(ACRES) =        1.3         PEAK FLOW RATE(CFS) =       6.00

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.41   FLOW VELOCITY(FEET/SEC.) =   7.24
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     33.00 =     540.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     33.00 TO NODE     34.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    371.00  DOWNSTREAM(FEET) =    367.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =    90.00   CHANNEL SLOPE =  0.0444
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   5.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.278
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                B        0.32      0.30     0.850    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.72
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.38
 AVERAGE FLOW DEPTH(FEET) =   0.55   TRAVEL TIME(MIN.) =   0.34
 Tc(MIN.) =    6.60
 SUBAREA AREA(ACRES) =     0.32       SUBAREA RUNOFF(CFS) =    1.45
 EFFECTIVE AREA(ACRES) =      1.59     AREA-AVERAGED Fm(INCH/HR) =   0.21
 AREA-AVERAGED Fp(INCH/HR) =   0.29  AREA-AVERAGED Ap =   0.71
 TOTAL AREA(ACRES) =        1.6         PEAK FLOW RATE(CFS) =       7.26

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.57   FLOW VELOCITY(FEET/SEC.) =   4.48
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     34.00 =     630.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     34.00 TO NODE     35.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    367.00  DOWNSTREAM(FEET) =    357.10
 CHANNEL LENGTH THRU SUBAREA(FEET) =   230.00   CHANNEL SLOPE =  0.0430
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   5.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.930
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                B        0.65      0.30     0.850    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       8.63
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.59
 AVERAGE FLOW DEPTH(FEET) =   0.61   TRAVEL TIME(MIN.) =   0.84
 Tc(MIN.) =    7.43
 SUBAREA AREA(ACRES) =     0.65       SUBAREA RUNOFF(CFS) =    2.73
 EFFECTIVE AREA(ACRES) =      2.24     AREA-AVERAGED Fm(INCH/HR) =   0.22
 AREA-AVERAGED Fp(INCH/HR) =   0.29  AREA-AVERAGED Ap =   0.75
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 TOTAL AREA(ACRES) =       2.2        PEAK FLOW RATE(CFS) =      9.49

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.64   FLOW VELOCITY(FEET/SEC.) =   4.69
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     35.00 =    860.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     35.00 TO NODE     36.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   357.10  DOWNSTREAM(FEET) =   356.50
 FLOW LENGTH(FEET) =    75.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  12.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.19
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       9.49
 PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =    7.64
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     36.00 =    935.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     36.00 TO NODE     36.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    7.64
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.854
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                B       1.10     0.30     0.850    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 SUBAREA AREA(ACRES) =    1.10      SUBAREA RUNOFF(CFS) =    4.55
 EFFECTIVE AREA(ACRES) =      3.34   AREA-AVERAGED Fm(INCH/HR) =  0.23
 AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.78
 TOTAL AREA(ACRES) =       3.3       PEAK FLOW RATE(CFS) =     13.90

****************************************************************************
 FLOW PROCESS FROM NODE     36.00 TO NODE     37.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   356.50  DOWNSTREAM(FEET) =   345.00
 FLOW LENGTH(FEET) =    60.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  22.37
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      13.90
 PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    7.68
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     37.00 =    995.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     37.00 TO NODE     37.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    7.68
 RAINFALL INTENSITY(INCH/HR) =   4.84
 AREA-AVERAGED Fm(INCH/HR) =  0.23
 AREA-AVERAGED Fp(INCH/HR) =  0.30
 AREA-AVERAGED Ap =  0.78
 EFFECTIVE STREAM AREA(ACRES) =       3.34
 TOTAL STREAM AREA(ACRES) =       3.34
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      13.90

 ** CONFLUENCE DATA **
  STREAM      Q      Tc  Intensity  Fp(Fm)     Ap     Ae    HEADWATER
  NUMBER    (CFS)  (MIN.) (INCH/HR) (INCH/HR)        (ACRES)   NODE
     1      99.44    9.56    4.268  0.22( 0.15) 0.68      26.8      20.00
     1     102.16   12.87    3.599  0.22( 0.15) 0.69      32.9      10.00
     2      13.90    7.68    4.838  0.30( 0.23) 0.78       3.3      30.00

 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     104.86    7.68    4.838  0.23( 0.16) 0.70      24.9      30.00
     2     111.62    9.56    4.268  0.23( 0.16) 0.70      30.1      20.00
     3     112.31   12.87    3.599  0.23( 0.16) 0.70      36.2      10.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =     112.31    Tc(MIN.) =     12.87
 EFFECTIVE AREA(ACRES) =      36.24   AREA-AVERAGED Fm(INCH/HR) =  0.16
 AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap =  0.70
 TOTAL AREA(ACRES) =      36.2
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     37.00 =   3365.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     37.00 TO NODE     45.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    345.00  DOWNSTREAM(FEET) =    339.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   275.00   CHANNEL SLOPE =  0.0218
 CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   5.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.537
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                B       0.41     0.30     0.850    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
```
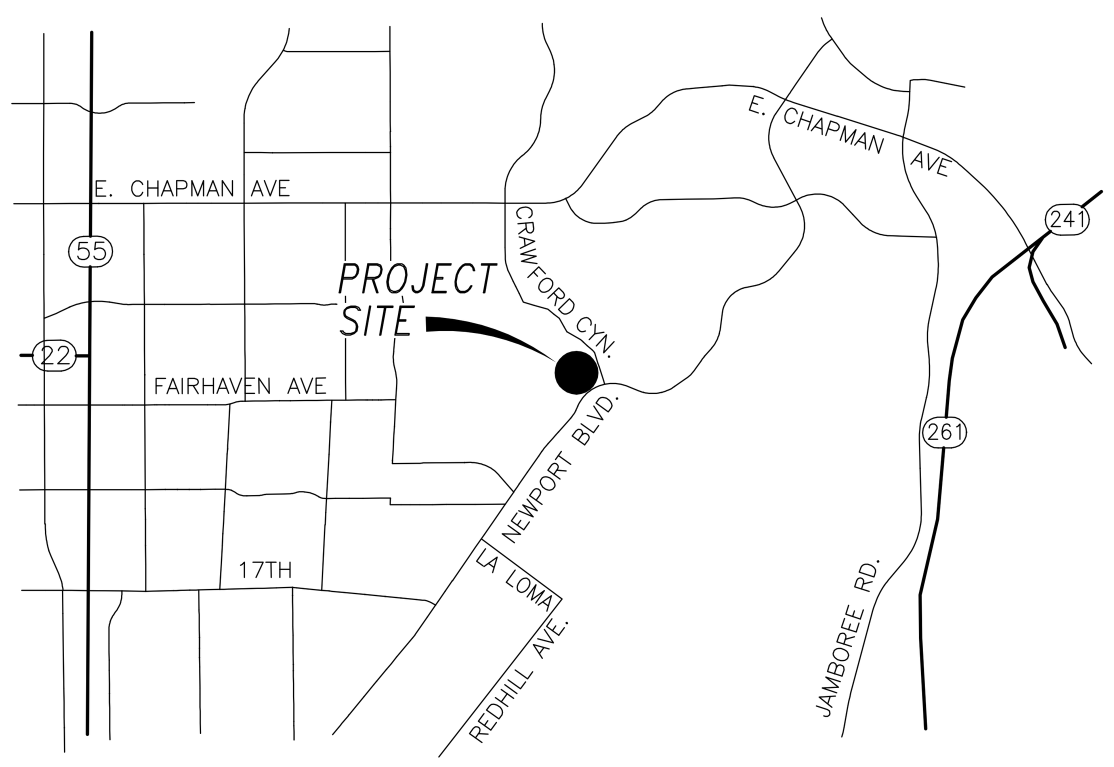

```
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     112.92
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  11.60
  AVERAGE FLOW DEPTH(FEET) =   0.83   TRAVEL TIME(MIN.) =   0.40
  Tc(MIN.) =   13.27
  SUBAREA AREA(ACRES) =     0.41       SUBAREA RUNOFF(CFS) =    1.21
  EFFECTIVE AREA(ACRES) =     36.65     AREA-AVERAGED Fm(INCH/HR) =   0.16
  AREA-AVERAGED Fp(INCH/HR) =   0.23  AREA-AVERAGED Ap =   0.70
  TOTAL AREA(ACRES) =      36.6        PEAK FLOW RATE(CFS) =     112.31
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.83   FLOW VELOCITY(FEET/SEC.) =  11.63
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     45.00 =    3640.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     45.00 TO NODE     45.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   13.27
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.537
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 B        0.22      0.30     0.100    76
  PUBLIC PARK                B        0.26      0.30     0.850    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.506
  SUBAREA AREA(ACRES) =    0.48      SUBAREA RUNOFF(CFS) =    1.46
  EFFECTIVE AREA(ACRES) =     37.13   AREA-AVERAGED Fm(INCH/HR) =  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap =  0.70
  TOTAL AREA(ACRES) =      37.1       PEAK FLOW RATE(CFS) =     112.85
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       37.1  TC(MIN.) =     13.27
  EFFECTIVE AREA(ACRES) =     37.13  AREA-AVERAGED Fm(INCH/HR)=  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap = 0.700
  PEAK FLOW RATE(CFS)   =     112.85

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)        (ACRES)    NODE
      1      105.13    8.09    4.698  0.24( 0.16) 0.70      25.8      30.00
      2      111.95    9.95    4.170  0.23( 0.16) 0.69      31.0      20.00
      3      112.85   13.27    3.537  0.23( 0.16) 0.70      37.1      10.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```



LOCATION MAP

PREPARED FOR:

OCparks

PREPARED BY:

HUNSAKER & ASSOCIATES
IRVINE, INC.
PLANNING • ENGINEERING • SURVEYING
Three Hughes • Irvine, CA 92618 • PH: (949) 583-1010 • FX: (949) 583-0759

SCALE: 1" =80'

80 40 0 80 160 240

GRAPHIC SCALE 1" = 80'

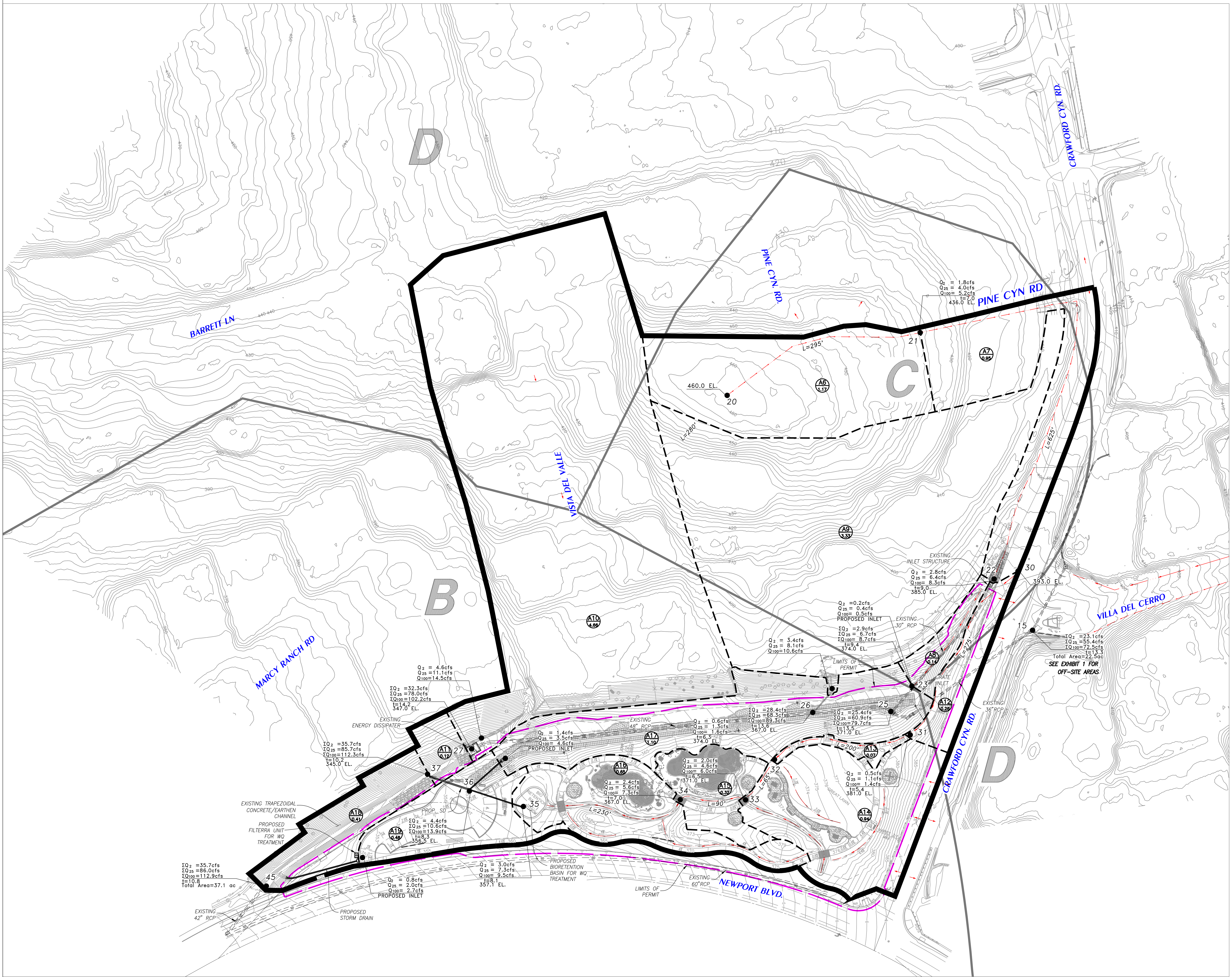
LEGEND

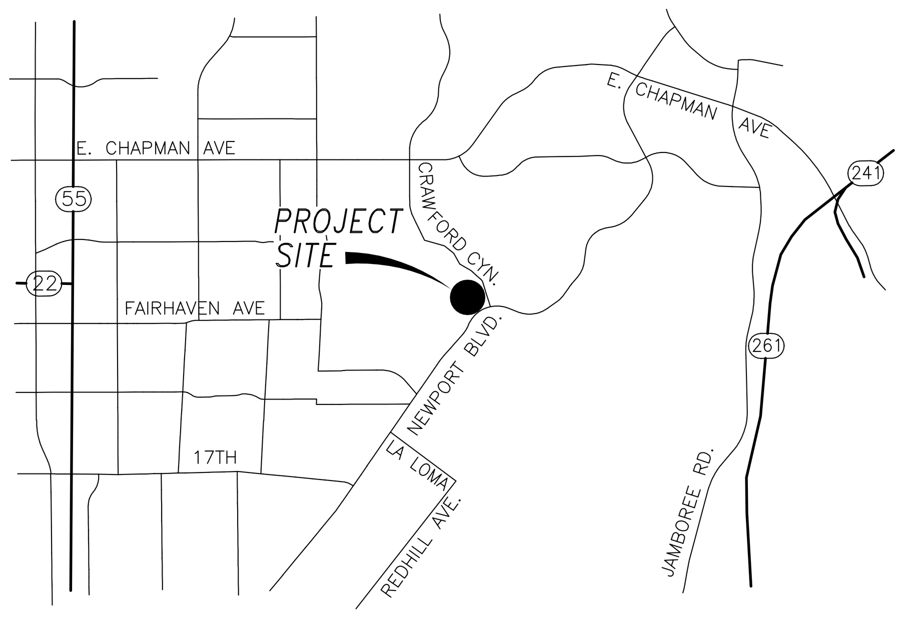
- PROJECT BOUNDARY
- MAJOR DRAINAGE BOUNDARY
- MINOR DRAINAGE BOUNDARY
- FLOW LINE WITH DIRECTION
- 100 — NODE NUMBER
- A 1.0 — AREA DESIGNATION / AREA ACREAGE (IN ACRES)
- Q_{100}=8.0cfs t=15.0 — PEAK FLOW RATE / TIME OF CONCENTRATION FOR 2-YEAR STORM
- ΣQ_{100}=10.0cfs t=15.0 — PEAK CONFLUENCE FLOW RATE / TIME OF CONCENTRATION FOR 2-YEAR STORM
- EXISTING STORM DRAIN
- C / D — SOIL GROUP BOUNDARY

EXHIBIT 1
OFF-SITE HYDROLOGY MAP
CRAWFORD PARK
S. CRAWFORD CANYON RD. & NEWPORT BLVD.
TUSTIN, CALIFORNIA 92782

HYDROLOGY MAP FOR CRAWFORD PARK – OFF-SITE

PLOTTED BY: Gary Guan DATE: Nov. 13, 2020 08:16:49 PM FILE: F:\1140\Engineering\SY_Hydrology\Crawford Park Existing Hydrology – Offsite.dwg





LOCATION MAP

PREPARED FOR:

OCparks

PREPARED BY:

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PLANNING • ENGINEERING • SURVEYING
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SCALE: 1" = 50'

50 25 0 50 100 150
GRAPHIC SCALE 1"= 50'

LEGEND

- PROJECT BOUNDARY
- MAJOR DRAINAGE BOUNDARY
- MINOR DRAINAGE BOUNDARY
- FLOW LINE WITH DIRECTION
- NODE NUMBER
- AREA DESIGNATION / AREA ACREAGE (IN ACRES)
- PEAK FLOW RATE / TIME OF CONCENTRATION FOR 2-YEAR STORM
- PEAK CONFLUENCE FLOW RATE / TIME OF CONCENTRATION FOR 2-YEAR STORM
- EXISTING STORM DRAIN
- PROPOSED STORM DRAIN
- C / D SOIL GROUP BOUNDARY

EXHIBIT 3
PROPOSED CONDITION HYDROLOGY MAP (ONSITE)
CRAWFORD PARK
S. CRAWFORD CANYON RD. & NEWPORT BLVD.
TUSTIN, CALIFORNIA 92782

HYDROLOGY MAP FOR CRAWFORD PARK - OFF-SITE

SECTION IV
REFERENCES

A. HYDROLOGIC SOIL GROUP MAP

ORANGE COUNTY
HYDROLOGY MANUAL

LEGEND
A B C D HYDROLOGIC SOIL GROUPS
HYDROLOGIC SOIL GROUP BOUNDARY

SOURCES:
BASE MAP - ORANGE COUNTY/RESOURCES & DEVELOPMENT MANAGEMENT DEPT GEOMATICS AND LAND INFORMATION SYSTEMS DIVISION
SOIL GROUPS - SOIL SURVEY OF ORANGE COUNTY AND WESTERN PART OF RIVERSIDE COUNTY, CALIFORNIA, USDA, SOIL CONSERVATION SERVICE, 1978.

HYDROLOGIC CLASSIFICATION OF SOILS
ORANGE COUNTY, CALIFORNIA

PLATE B

B. CRAWFORD CANYON ROAD DRAINAGE IMPROVEMENTS AND CONSTRUCTION PHASE 1

OC PUBLIC WORKS

SANTA ANA, CALIFORNIA

SHANE L. SILSBY, DIRECTOR

PLANS FOR CONSTRUCTION OF

CRAWFORD CANYON ROAD DRAINAGE IMPROVEMENTS AND CONSTRUCTION, PHASE 1

NEAR THE INTERSECTION OF

CRAWFORD CANYON ROAD

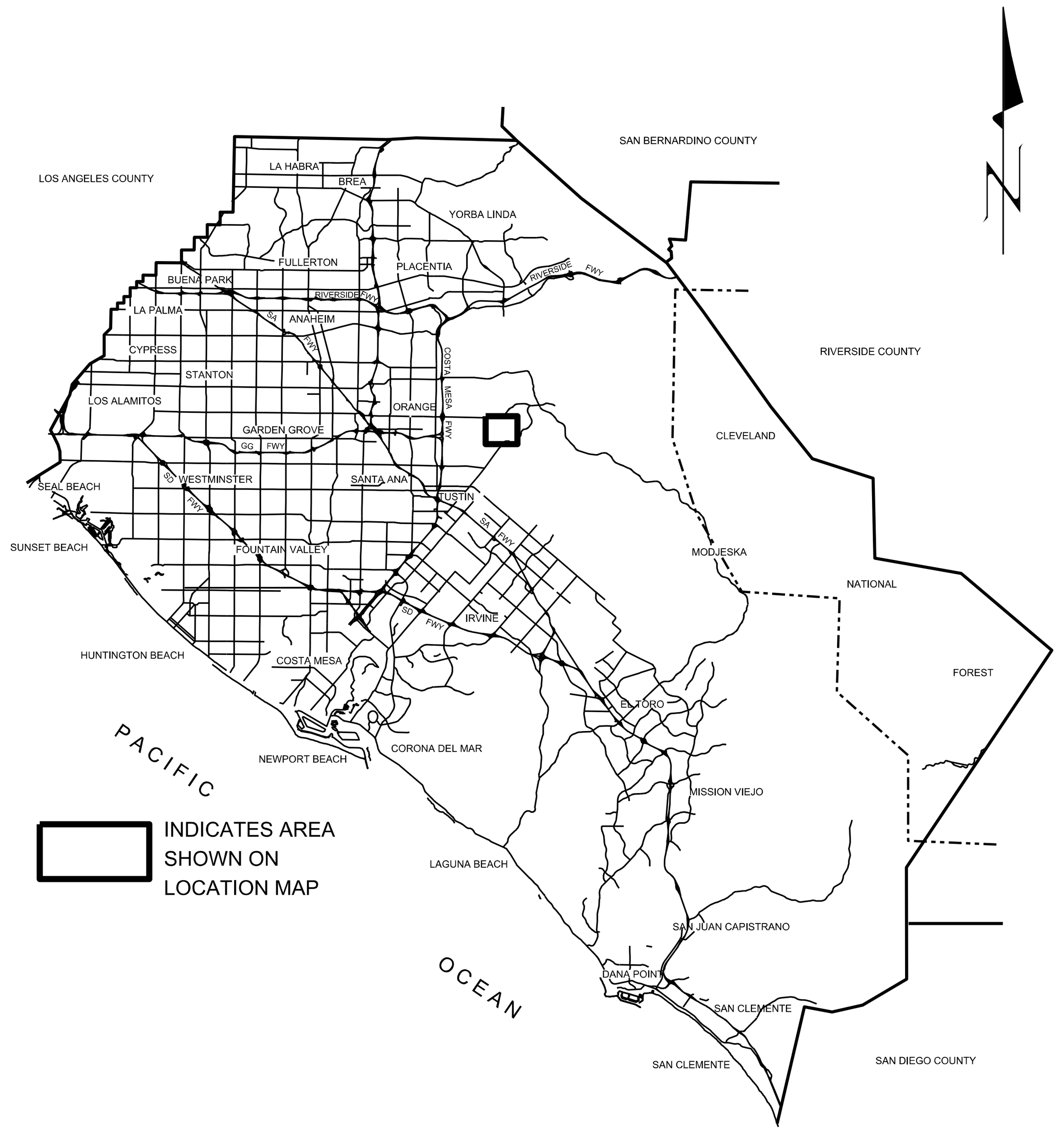
AND

NEWPORT BOULEVARD

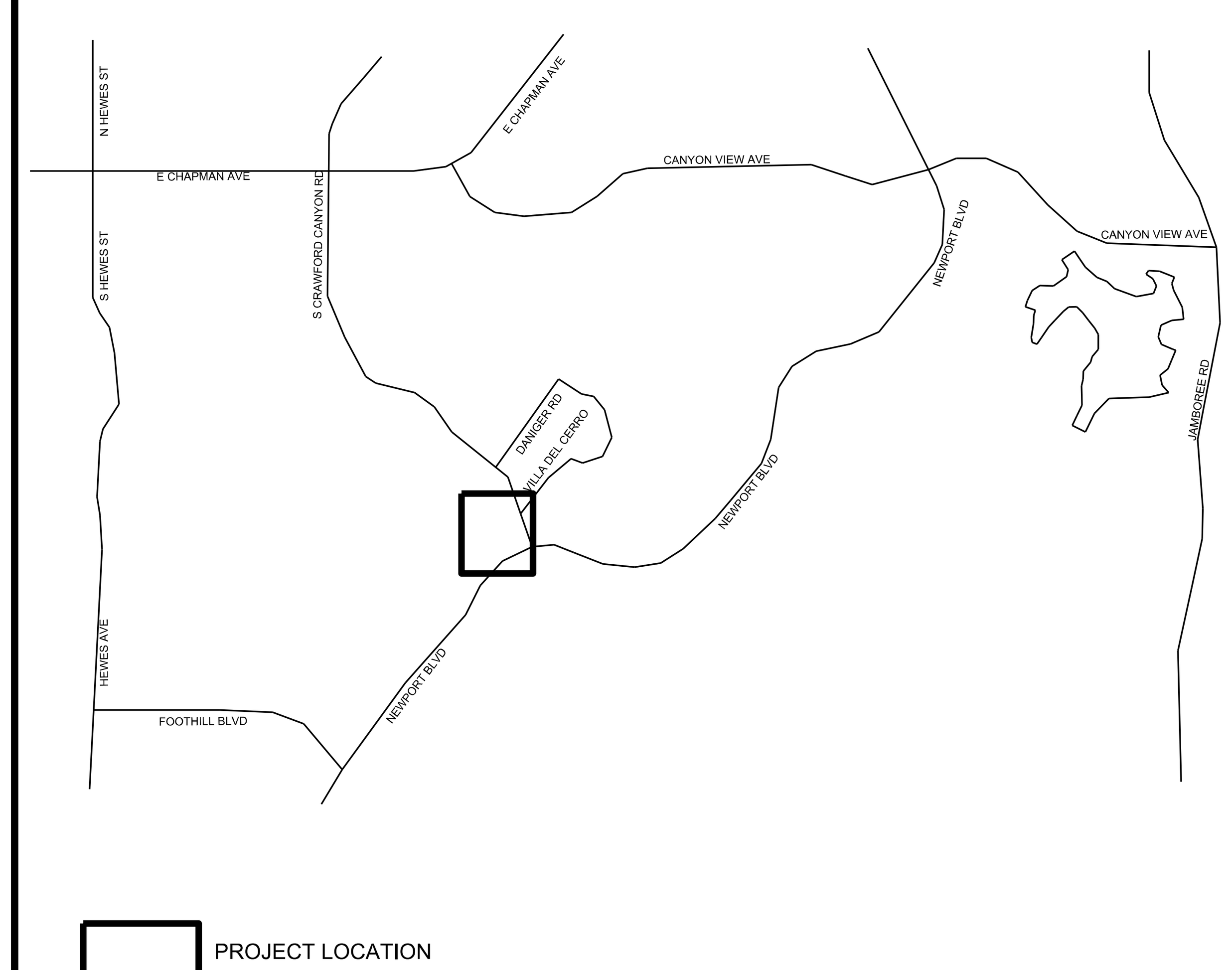
DECEMBER 2016

FUNDED BY: COUNTY OF ORANGE ROAD FUNDS

POST-PROJECT OWNERSHIP AND MAINTENANCE RESPONSIBILITY: COUNTY OF ORANGE



VICINITY MAP
(NO SCALE)



LOCATION MAP
(NO SCALE)

INDEX OF SHEETS

SHEET	DESCRIPTION
1	TITLE SHEET
2	TYPICAL SECTIONS & ABBREVIATIONS
3	PIPE DETAILS
4	INLET STRUCTURE DETAILS
5	MISCELLANEOUS DETAILS
6	PLAN AND PROFILE LINE A STA 10+12.24 TO STA 13+50.00
7	PLAN AND PROFILE LINE A STA 13+50.00 TO STA 16+65.56
8	PLAN AND PROFILE LINE B STA 10+00.00 TO STA 12+72.00

UTILITY OWNER	PHONE NO.	CONTACT
SO. CALIF. GAS	RICHARD CLENDINENG	(714) 634-3262
EAST ORANGE COUNTY WATER DIST.	JERRY MENDZER	(714) 501-5596
ORANGE COUNTY SANITATION	RUDY DAVILA	(714) 593-7348
SO. CALIF. EDISON	JILL MONACO	(714) 973-5453
AT&T	RENEE BURGERON	(714) 237-6277
COX COMMUNICATIONS	JIM MCBRYDE	(626) 241-0948
CHARTER	DAVID CISNEROS	(714) 591-4888
CITY OF ORANGE WATER DEPARTMENT	JANETTE PICHAY & ROBERT BAEHNER	(714) 288-2475

BENCH MARK:

O.C.S. BM
3A-110-79 ELEV. = 403.068'
3A-89-71 ELEV. = 372.768'

LEVEL YEAR 1979

NGVD 29 1976 ADJ.

BASIS OF BEARINGS:

THE BASIS OF BEARING SHOWN HEREON IS BASED ON THE GRID BEARING BETWEEN O.C.S. HORIZONTAL CONTROL STATIONS G.P.S NO. 3172 BEING N88°48'15"W

OC PUBLIC WORKS

SUBMITTED: ______________________ DATE
REGINA HU, PE
SENIOR CIVIL ENGINEER
OC PUBLIC WORKS

RECOMMENDED: ______________________ DATE
NARDY KHAN, PE
DEPUTY DIRECTOR
OC PUBLIC WORKS

APPROVED: ______________________ DATE
KHALID M. BAZMI, PE
COUNTY ENGINEER / ASSISTANT DIRECTOR
OC PUBLIC WORKS

NO.	DESCRIPTION	SHT.	APPROVED	DATE

REVISIONS

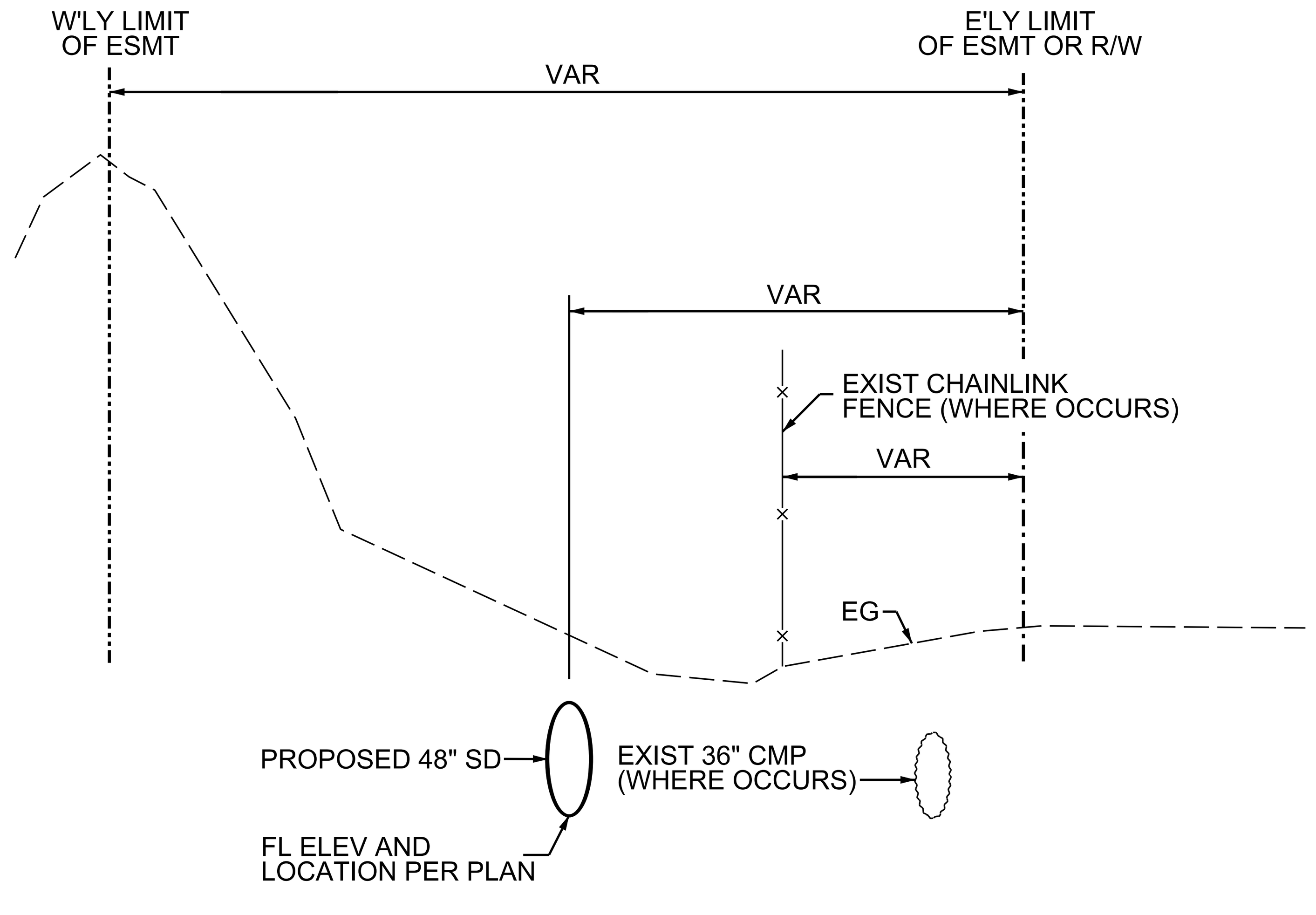
W. O. NO. ER16006

DWG. NO. ________

SHEET 1 OF 8

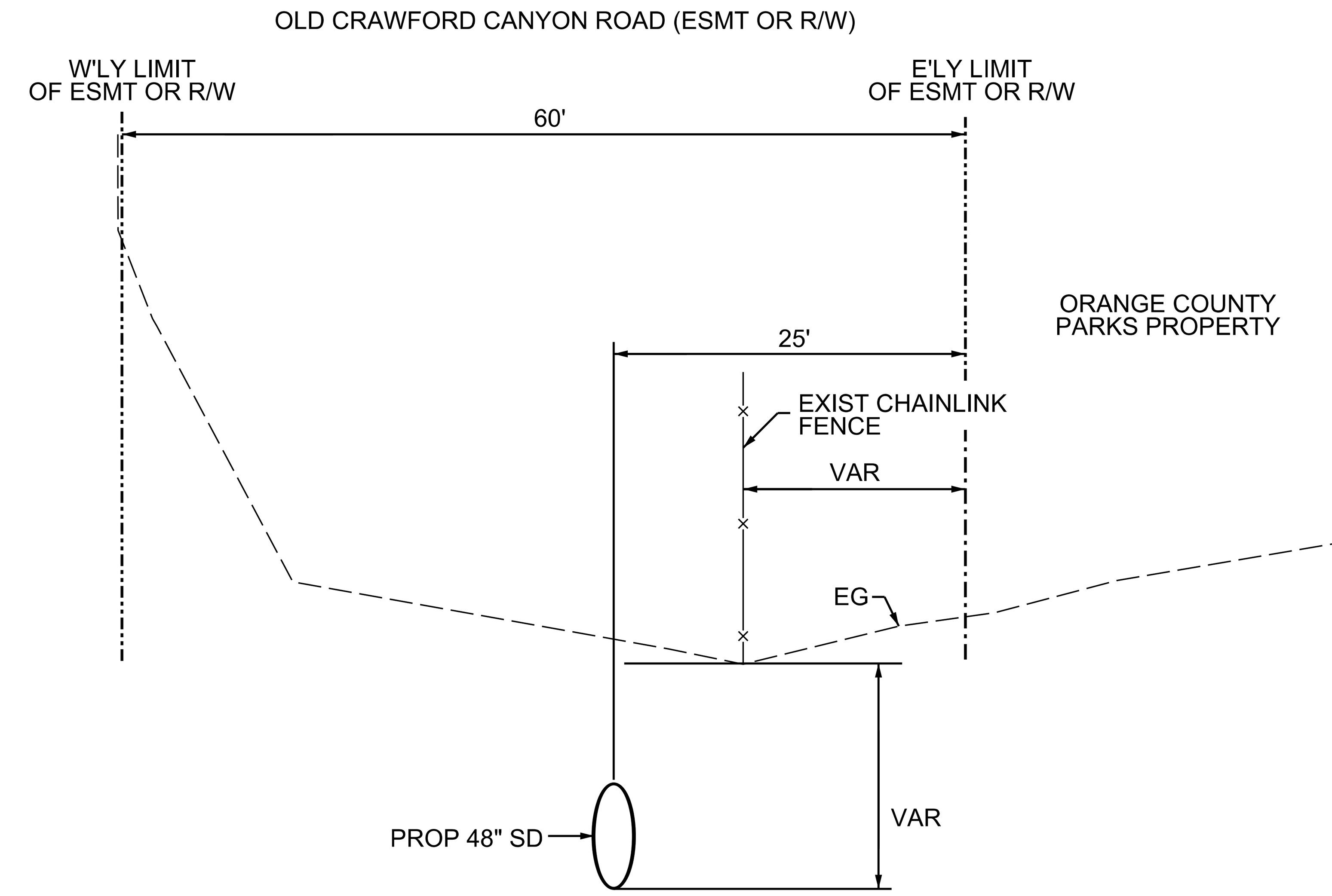
FILE NAME:$FILEL$

DATE PLOTTED :$DATE$



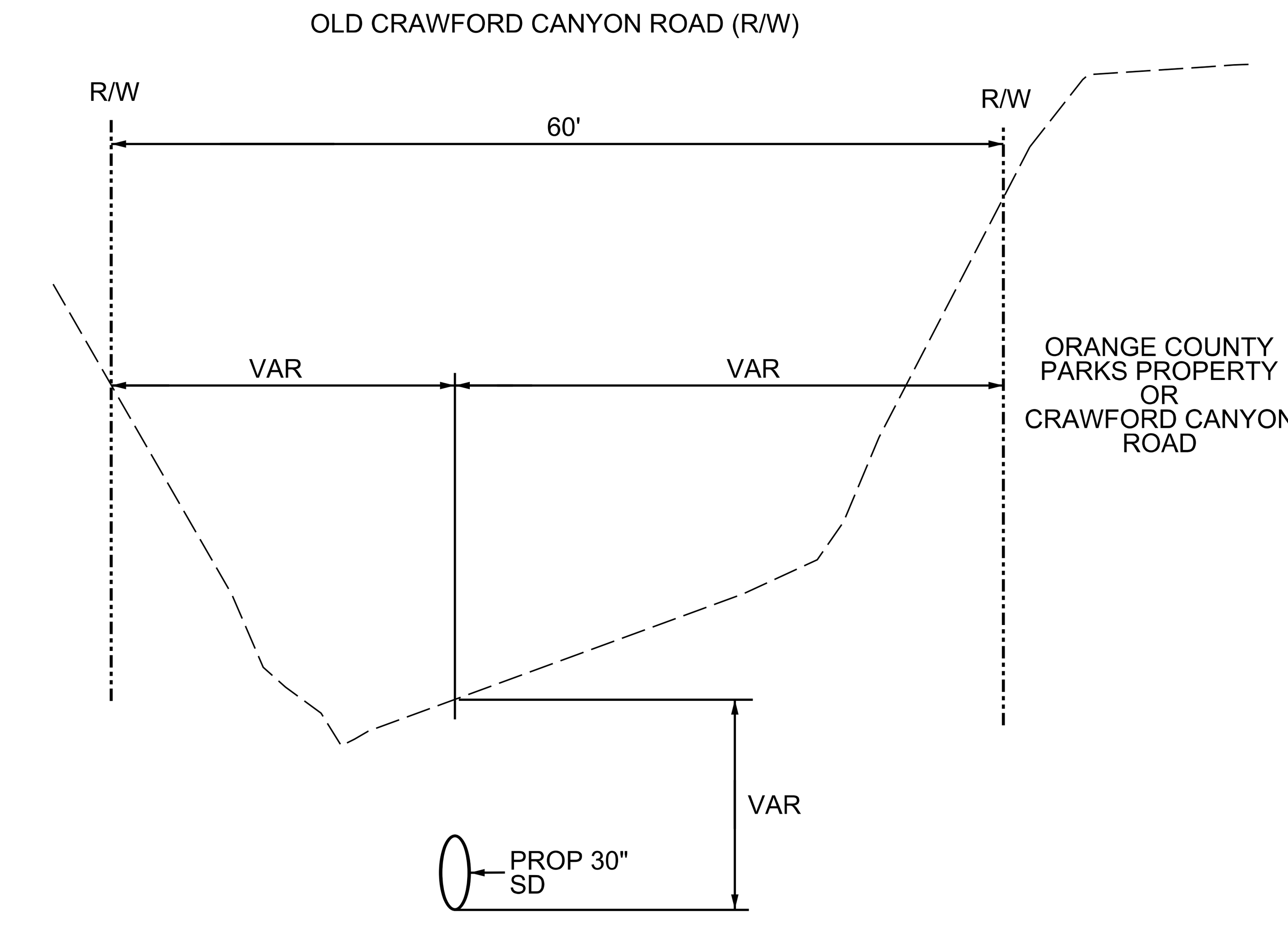
"LINE A" - STA 10+12 TO STA 11+44

TYPICAL SECTION
SCALE: NOT TO SCALE



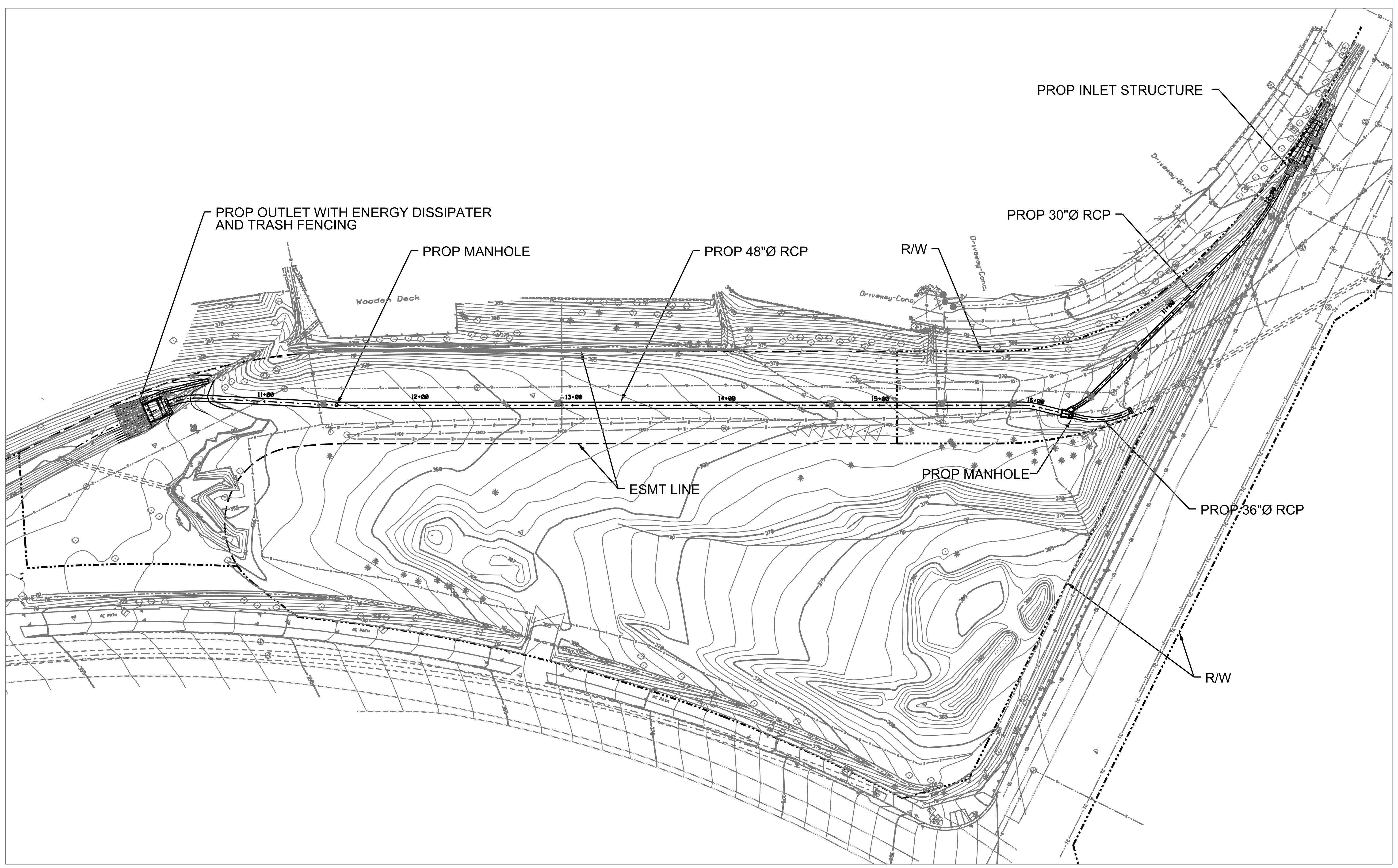
"LINE A" - STA 11+48 TO STA 15+50

TYPICAL SECTION
SCALE: NOT TO SCALE



"LINE B" - STA 10+00 TO STA 12+18

TYPICAL SECTION
SCALE: NOT TO SCALE

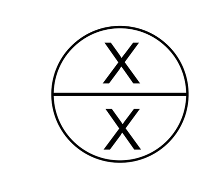


OVERALL SITE PLAN

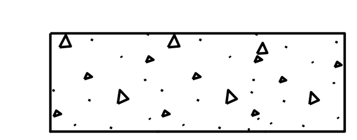
SCALE: 1" = 50'-0"

LIST OF ABBREVIATIONS

" OR IN	INCH
' OR FT	FOOT
/	OF
ABAN, ABND OR ABAND	ABANDONED UTILITY
AC / ASPH	ASPHALT CONCRETE
AV OR AVE	AVENUE
BC	BEGINNING OF CURVE
BEG	BEGIN
BOTT	BOTTOM
BP	BEGIN PIPE
CB	CATCH BASIN
CCP	CONCRETE CYLINDER PIPE
CIP	CAST IRON PIPE
CISP	CAST IRON SOIL PIPE
CFM	CUBIC FEET PER MINUTE
CFS	CUBIC FEET PER SECOND
CJ	CONSTRUCTION JOINT
CL	CENTERLINE
CML	CEMENT MORTAR LINED
CMU	COLUMN
CML&C	CONCRETE MASONRY UNIT
CMP	CEMENT MORTAR LINED & COATED
COL	CORRUGATED METAL PIPE
CONC	CONCRETE
CONT	CONTINUOUS
CP	CATHODIC PROTECTION
CT	CALTRANS
D	DEGREES
DI	DRAIN INLET
DIA	DIAMETER
DG	DECOMPOSED GRANITE
DWG	DRAWING
E	EAST
EC	END OF CURVE
EF	EACH FACE
EG	EXISTING GRADE
EJ	EXPANSION JOINT
EL/ELEV	ELEVATION
ELEC	ELECTRICAL
EP	END PIPE
EQ	EQUAL
ES	EACH SIDE
ESMT	EASEMENT
EVC	END OF VERTICAL CURVE
EW	EACH WAY
EXIST	EXISTING
E'LY	EASTERNLY
FF	FINISHED FLOOR
FL	FLOW LINE
FO	FIBER OPTIC (LINE)
FS	FINISHED SURFACE
FT	FEET
G	GAS (LINE)
GA	GAUGE
GALV	GALVANIZED
GPM	GALLON PER MINUTE
HC	HIGH CONFIDENCE
INV	INVERT
L	LENGTH
LF	LINEAR FEET
LT	LEFT
MAT'L	MATERIAL
MAX	MAXIMUM
MBGR	METAL BEAM GUARD RAIL
MH	MANHOLE
MIN	MINIMUM
NO	NUMBER
NTS	NOT TO SCALE
OCPW	ORANGE COUNTY PUBLIC WORKS
PIP	PROTECT IN PLACE
PL	PLATE
R	RADIUS LENGTH
RCP	REINFORCED CONCRETE PIPE
ROW OR R/W	RIGHT OF WAY
RT	RIGHT
SS	SANITARY SEWER
SCE	SOUTHERN CALIFORNIA EDISON
SCH	SCHEDULE
SD	STORM DRAIN (LINE)
SPECS	SPECIFICATIONS
STA	STATION STANDARD
STD	STANDARD
STL	STEEL
SWR	SEWER
T/	TOP OF
T OR TELE	TELEPHONE
TRANS	TRANSITION
TYP	TYPICAL
VAR	VARIES
W	WEST OR WIDTH
W/	WITH
W/O	WITHOUT
WTR	WATER(LINE)
W'LY	WESTERNLY



DETAIL NUMBER
SHEET NUMBER



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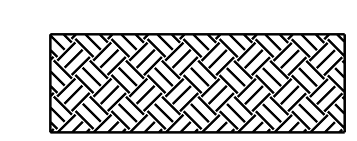


NATIVE SOIL

WOOD

100% SUBMITTAL

COUNTY OF ORANGE CALIFORNIA

MARK	DESCRIPTION	DATE	APPR.

PREPARED UNDER THE RESPONSIBLE CHARGE OF: | DATE

REGISTERED PROFESSIONAL ENGINEER JOSEPH F. LONG C 54329 Exp. 12-31-16 CIVIL STATE OF CALIFORNIA

DESIGNED BY: DEREK S. PLAZA
DRAWN BY: DCM
CHECKED BY: JFL
DRAWING CODE:
FILE NAME:
PLOT DATE: $DATE$
SCALE: AS SHOWN

COUNTY OF ORANGE
OC PUBLIC WORKS

URS
999 TOWN & COUNTRY RD.
ORANGE, CA 92868
TEL: 714.648.7257

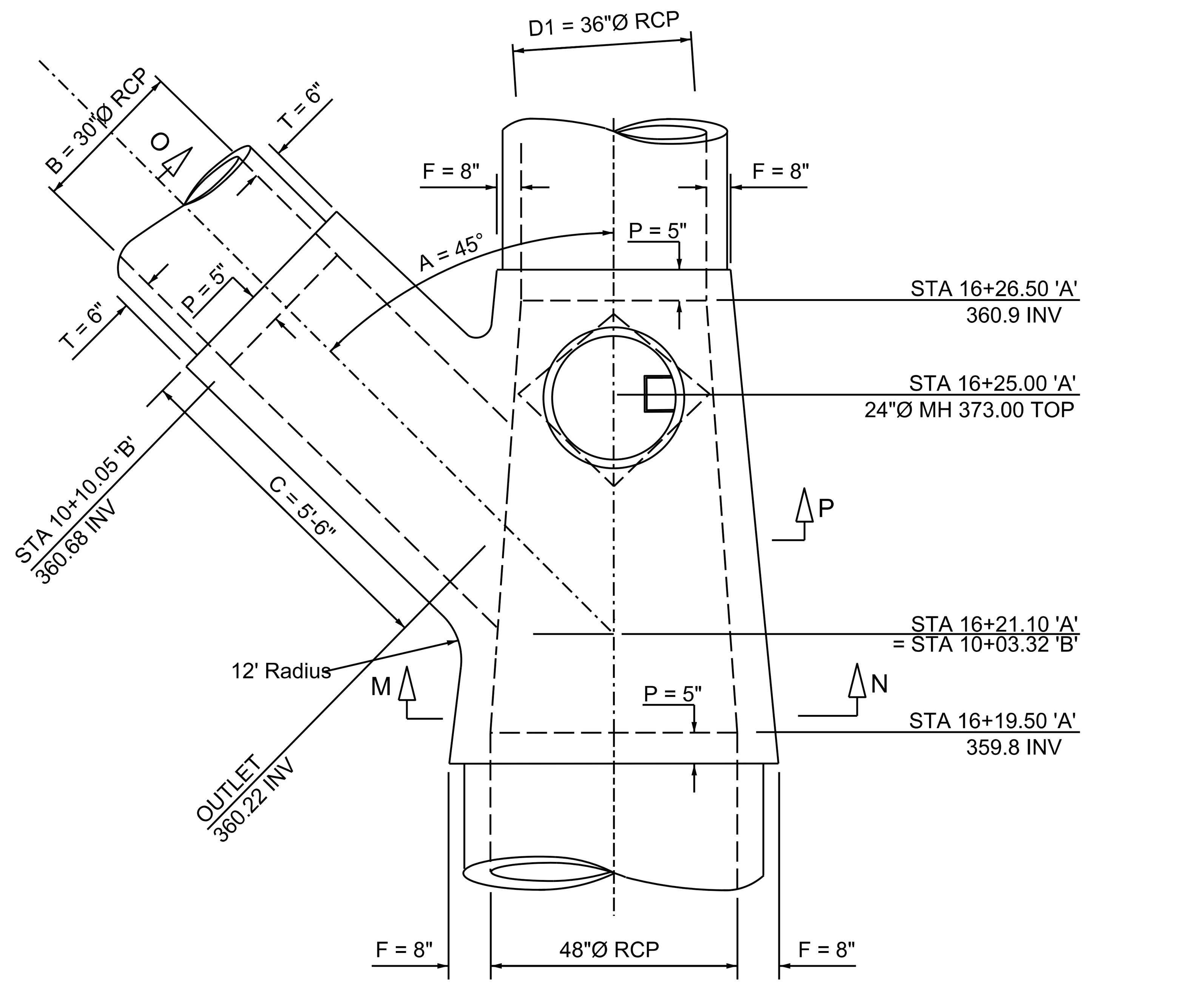
CRAWFORD CANYON ROAD DRAINAGE IMPROVEMENTS AND CONSTRUCTION, PHASE 1 NEAR THE INTERSECTION OF CRAWFORD CANYON ROAD AND NEWPORT BOULEVARD

TYPICAL SECTIONS & ABBREVIATIONS

Sheet Reference Number

2

FILE NAME:$FILE$



SPPWC 322-2 DIMENSIONS	
DIMENSION	VALUE
∠A	45°
B	30"
C	5'-6"
D1	36"
D2	48"
F	8"
P	5"

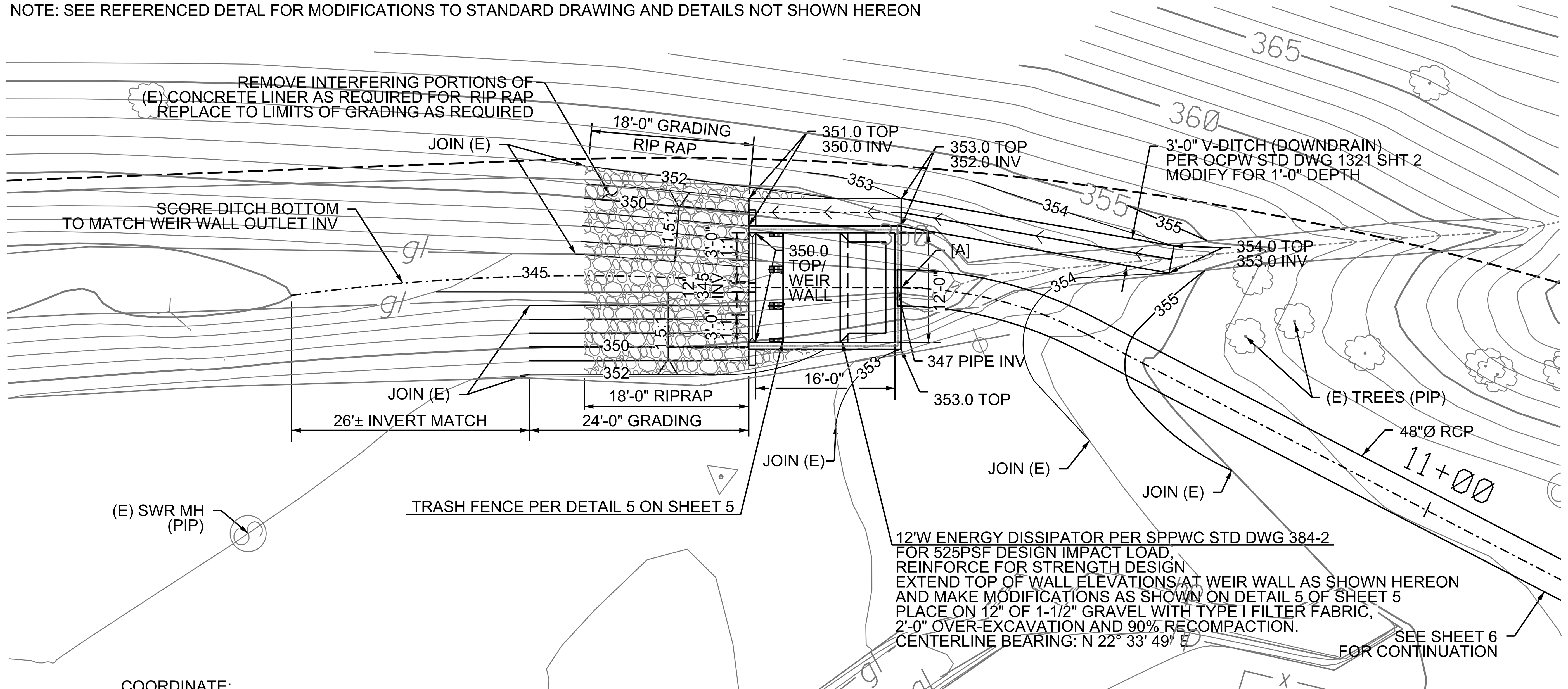
NOTE: FOR INFORMATION NOT SHOWN HEREON, SEE REFERENCE DETAIL SPPWC 322-2 & 322-2 OC

1/7 MANHOLE PIPE-TO-PIPE (LARGE SIDE INLET)

SCALE: 1" = 1'-0"

SPPWC STD DWG 384-2 DIMENSIONS (525 PSF DESIGN LOAD)															
WIDTH (W)	H	L	a	b	c	d	e	f	g	T1	T2	T3	T4	T5	T6
12'-0"	9'-0"	16'-0"	6'-0"	4'-6"	6'-0"	2'-0"	1'-0"	2'-6"	5'-0"	9"	8"	10"	8.5"	9"	9"

NOTE: SEE REFERENCED DETAL FOR MODIFICATIONS TO STANDARD DRAWING AND DETAILS NOT SHOWN HEREON

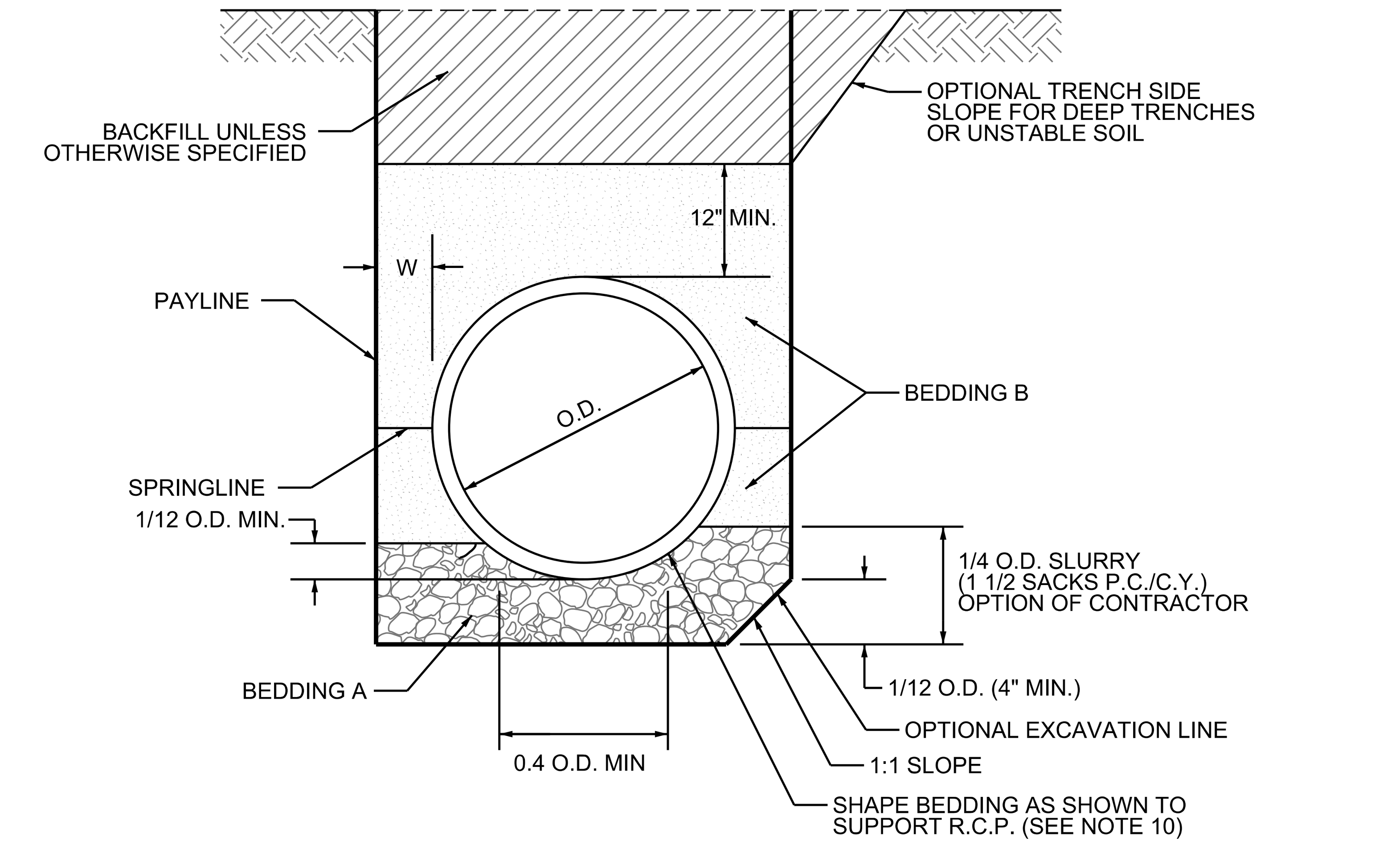


COORDINATE:
[A] - NORTHING: 2,228,801.280, EASTING: 6,093,909.807

NOTES:
RIPRAP SHALL BE CALTRANS 1/4 TON, 3'-0" DEEP MIN, METHOD OF PLACEMENT TO BE DETERMINED BY CONTRACTOR AND APPROVED BY ENGINEER.
RIPRAP SHALL BE PLACED ON TYPE I FILTER FABRIC PER SPECIFICATIONS.

2/6 OUTLET ENERGY DISSIPATOR & GRADING PLAN

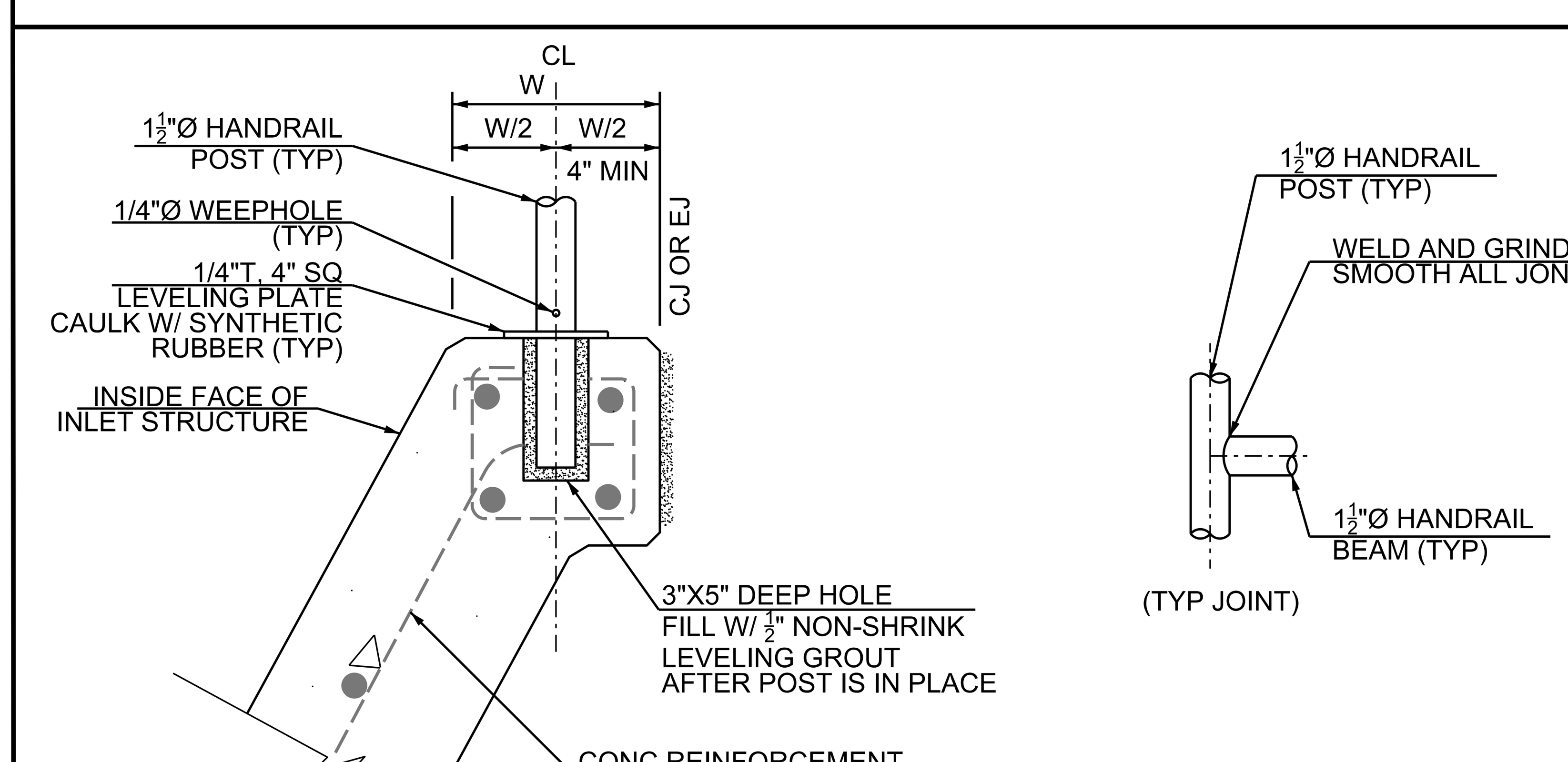
SCALE: 1" = 5'-0"



NOTES :
1. BEDDING A SHALL BE COMPOSED OF SAND, NO.3 OR NO.4 CRUSHED ROCK OR GRAVEL PER STD. SPECIFICATIONS OR OTHER GRANULAR MATERIAL AS MAY BE SPECIFIED OR APPROVED BY THE ENGINEER.
2. BEDDING B SHALL BE COMPOSED OF SAND OR OTHER GRANULAR MATERIAL AS MAY BE SPECIFIED OR APPROVED BY THE ENGINEER AND SHALL CONFORM TO SECTION 306-1.2.1 OF THE STD. SPECIFICATIONS.
3. BEDDING B SHALL BE COMPACTED TO A RELATIVE COMPACTION OF NOT LESS THAN 90 PERCENT UNLESS OTHERWISE SPECIFIED.
4. BEDDING B SHALL BE PLACED IN TWO OR MORE LIFTS FOR O.D. GREATER THAN 60 INCHES.
5. BACKFILL SHALL BE PER SECTION 306-1.3 OF THE STD. SPECIFICATIONS.
6. WHERE THE COVER IS 8 FEET OR LESS, "W" MUST BE GREATER THAN OR EQUAL TO 6 INCHES. WHERE THE COVER IS GREATER THAN 8 FEET, "W" MUST BE BETWEEN 6 AND 10 INCHES INCLUSIVE FOR PIPES UP TO AN INCLUDING 96 INCHES IN DIAMETER. FOR PIPES OVER 96 INCHES IN DIAMETER, "W" MUST BE BETWEEN 6 AND 12 INCHES INCLUSIVE.
7. "W" SHALL INCLUDE THE THICKNESS OF ANY SHORING.
8. SHORING SHALL BE A MINIMUM OF 6 INCHES FROM THE PIPE AT SPRINGLINE.
9. AN IMPROVED BEDDING METHOD SHALL BE SUBMITTED TO THE ENGINEER FOR ANY "W" OTHER THAN THAT PERMITTED IN NOTE 6.
10. THE TRENCH BOTTOM SHALL BE SHAPED AS SHOWN, OR THE CONTRACTOR, AT HIS OPTION MAY CHOOSE NOTE TO SCREED BEDDING "A" IN WHICH CASE, THE PIPE SHALL BE BACKFILLED TO A DEPTH OF 1/4 O.D. WITH TRENCH BACKFILL SLURRY AT HIS EXPENSE.
11. THIS BEDDING DETAIL SHALL ONLY BE USED FOR R.C.P. OR AS APPROVED BY ENGINEER.
12. PLASTIC PIPE BEDDING SHALL BE DETAILED ON PLANS.

3/6 TYPICAL PIPE TRENCH & BEDDING DETAIL - OCPW STD 1319

SCALE: NOT TO SCALE



100% SUBMITTAL

NOTE: ALL HANDRAIL METAL IS ALUMINUM

4/4 HANDRAIL DETAILS

NOT TO SCALE

THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL

COUNTY OF ORANGE CALIFORNIA

MARK	DESCRIPTION	DATE	APPR.

PREPARED UNDER THE RESPONSIBLE CHARGE OF: | DATE

JOSEPH T. LONG C 54329 Exp. 12-31-16 CIVIL STATE OF CALIFORNIA REGISTERED PROFESSIONAL ENGINEER

DESIGNED BY: DEREK S. PLAZA
DRAWN BY: DCM
CHECKED BY: JFL
DRAWING CODE:
FILE NAME:
PLOT DATE: $DATE$
SCALE: AS SHOWN

COUNTY OF ORANGE
OC PUBLIC WORKS

URS
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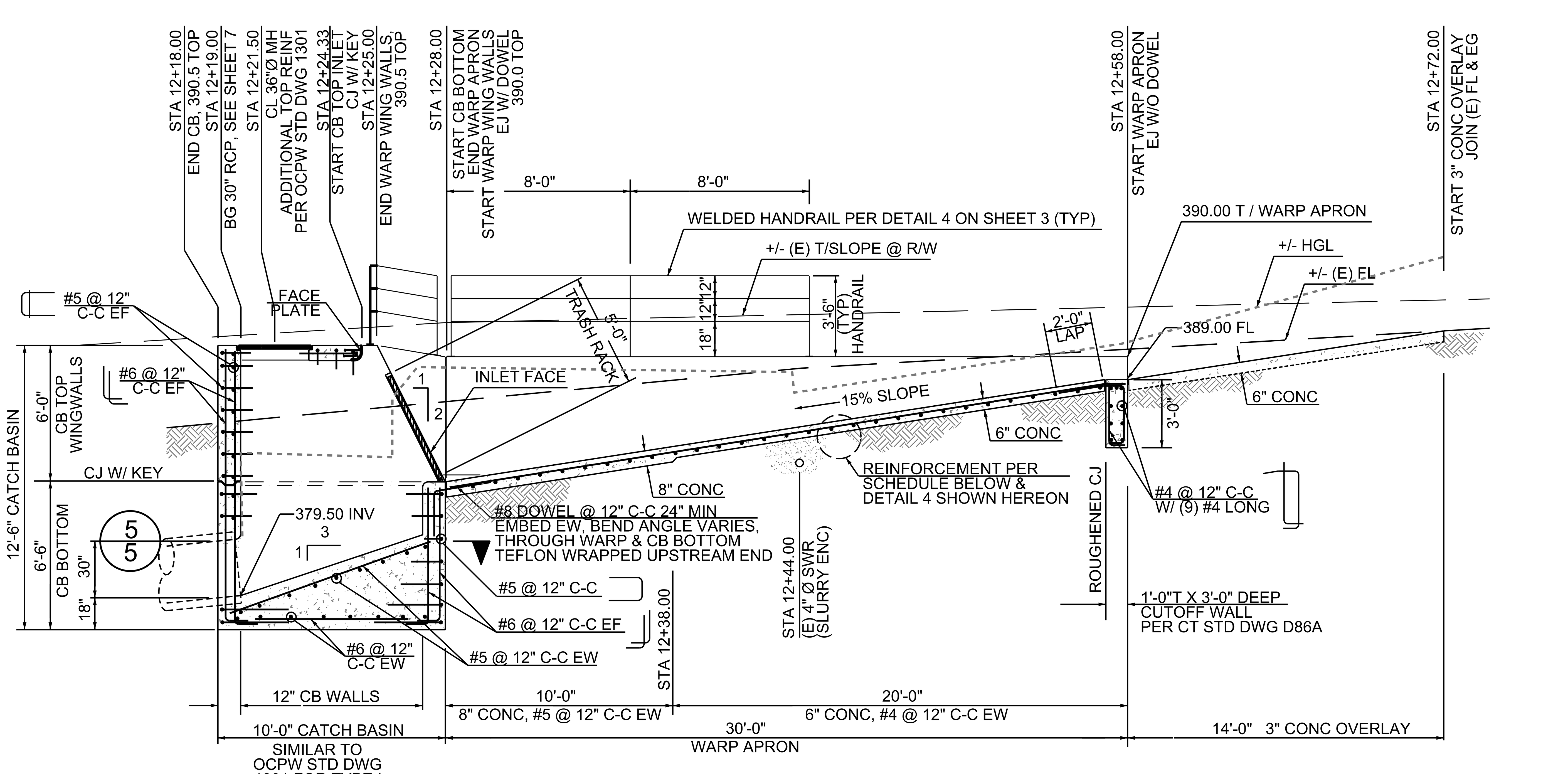
ORANGE, CA 92868
TEL: 714.648.7257

CRAWFORD CANYON ROAD DRAINAGE IMPROVEMENTS AND CONSTRUCTION, PHASE 1 NEAR THE INTERSECTION OF CRAWFORD CANYON ROAD AND NEWPORT BOULEVARD

PIPE DETAILS

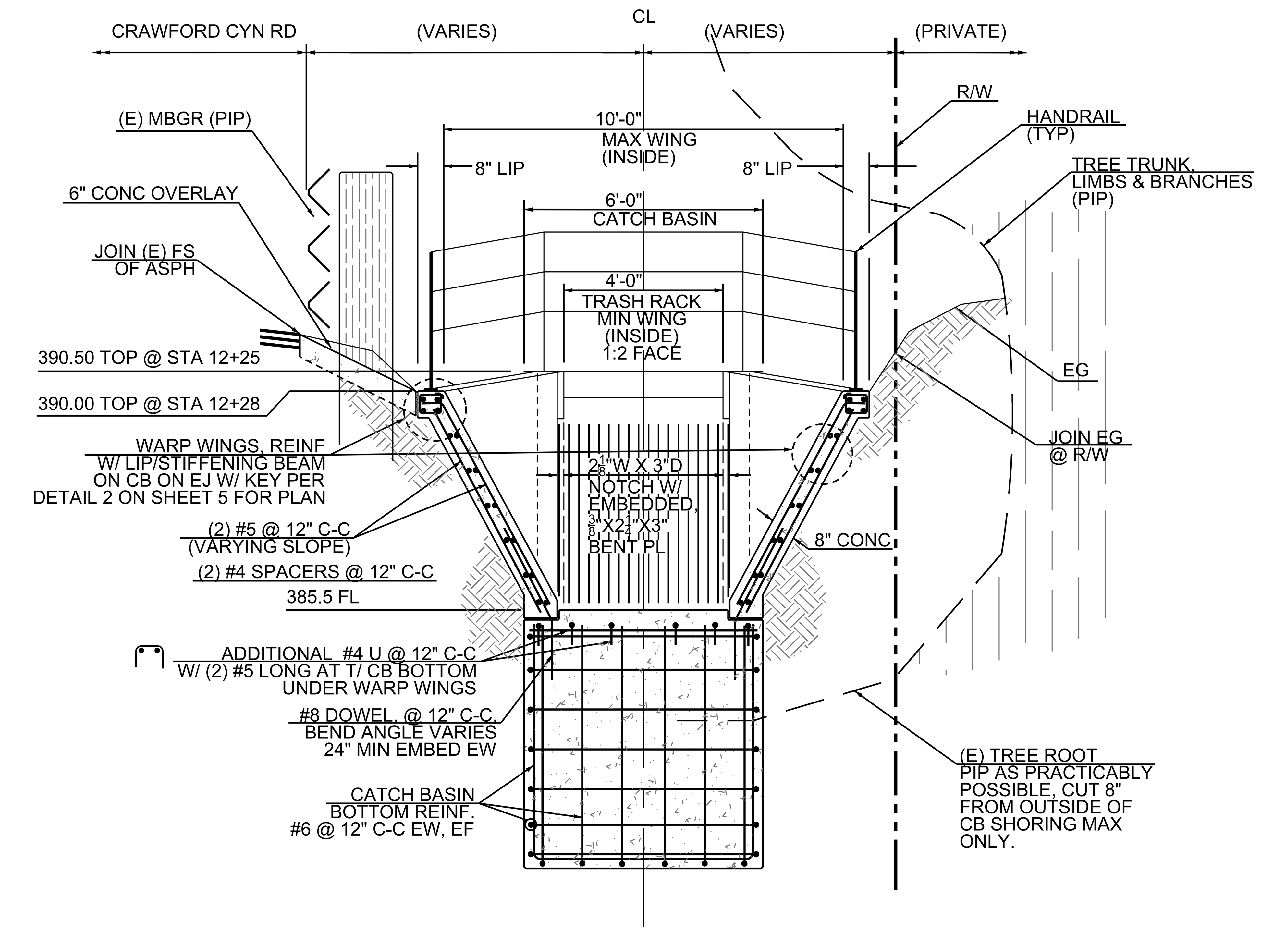
Sheet Reference Number
3

FILE NAME:$FILE$

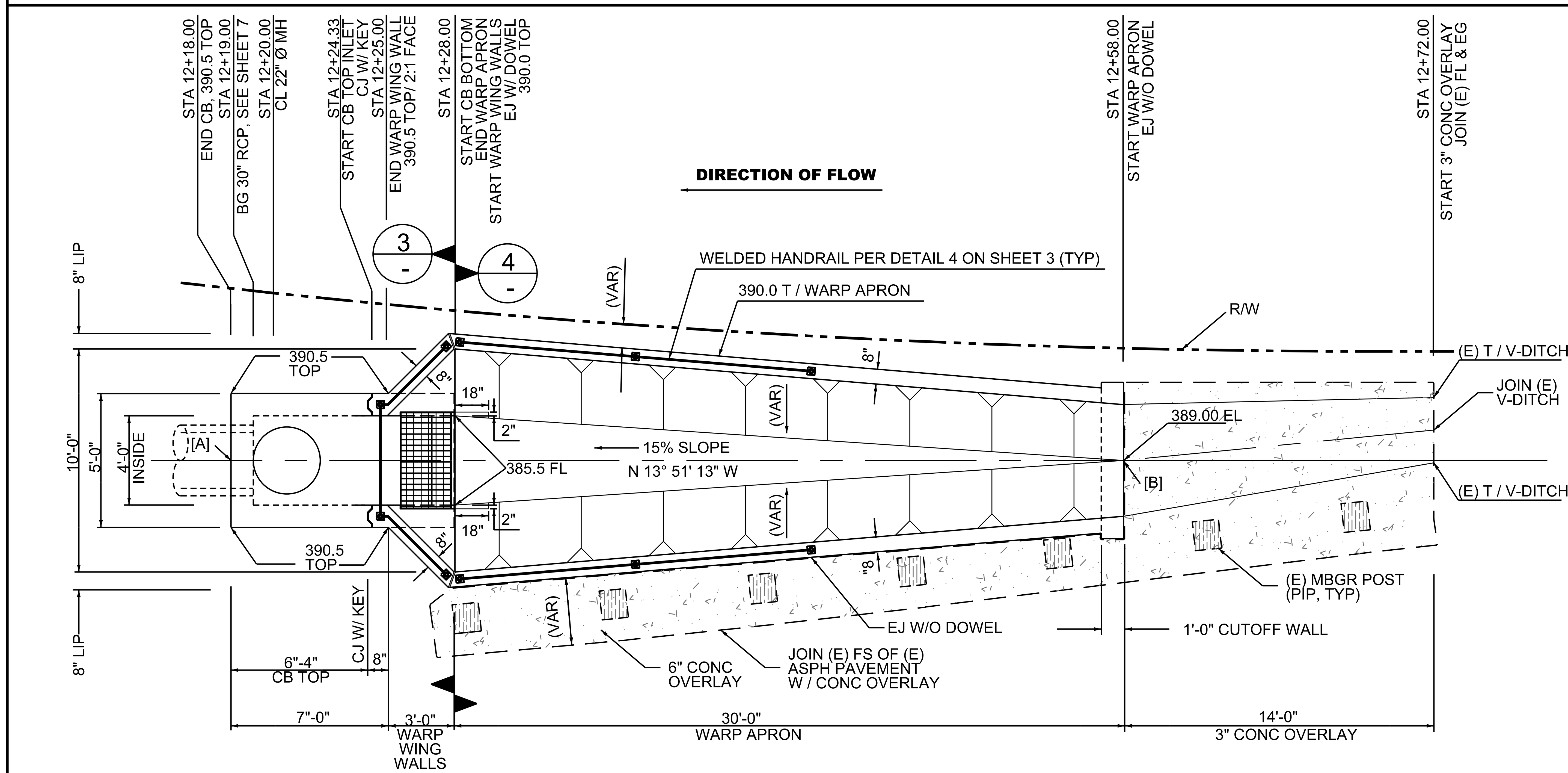


NOTES (TYP THIS SHEET):
- SEE FULL REFERENCED STANDARD DRAWINGS FOR DETAILS NOT SHOWN HEREON.
- ALL CONSTRUCTION JOINTS SHALL BE PER OCPW STD DWG 1318, AND WATERPROOFED WITH WALLS-COAT CURING COMPOUND.
- PROVIDE STEEL TROWEL FINISH ON ALL WATER BEARING SURFACES.
- TRASH RACK (GRATE) SHALL BE PER OCPW STD DWG 1307, PAGE 3, MADE OF 304 SS, EMBED FRAME IN WARP WING WALLS.
- PROVIDE STEPS (NOT SHOWN) IN CATCH BASIN UNDER MANHOLE PER OCPW STD DWG 1307.

1/7 INLET PROFILE THROUGH CENTERLINE
SCALE: 1/4" = 1'-0"



3/- INLET PROFILE (DOWNSTREAM)
SCALE: 3/8" = 1'-0"

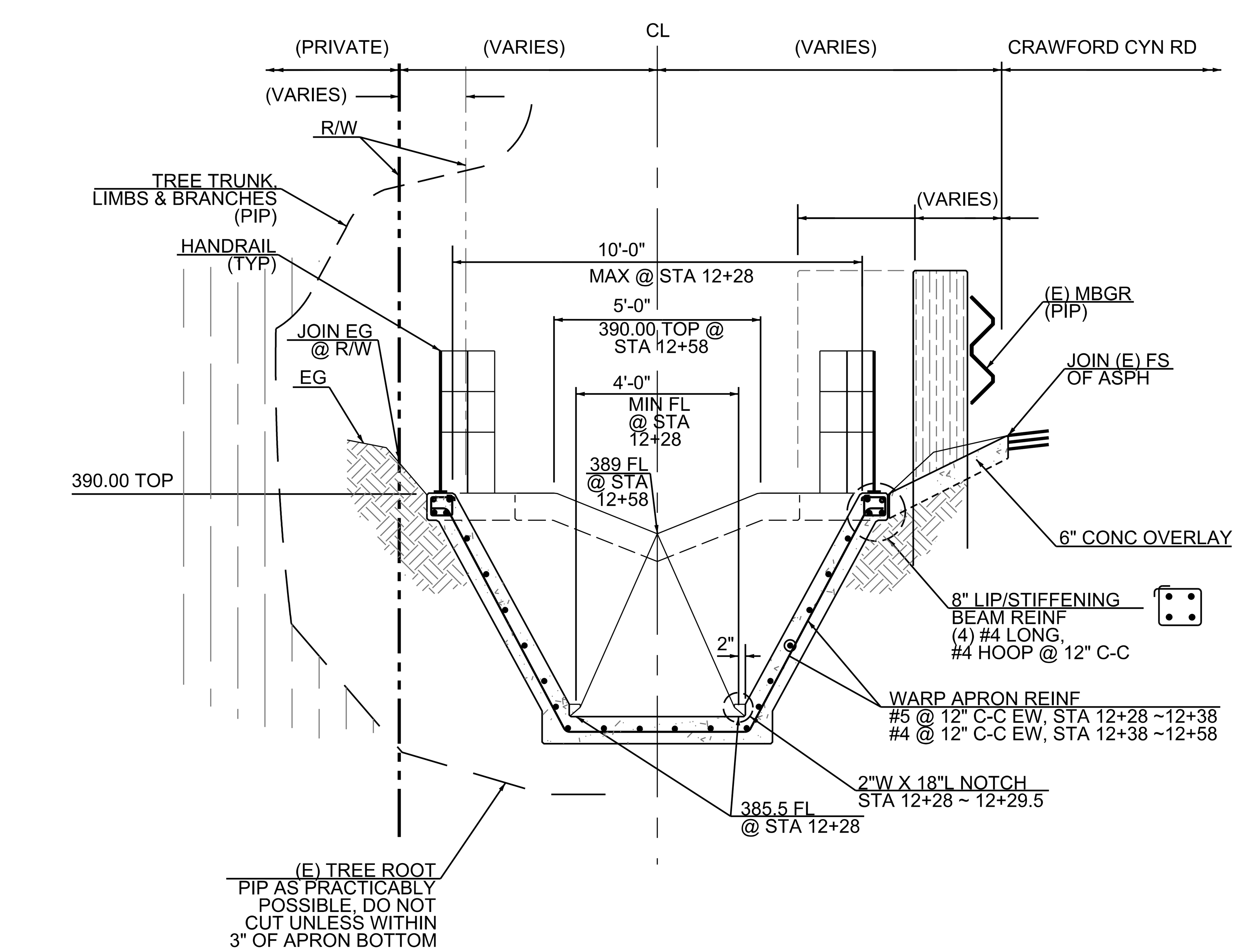


COORDINATES:

[A] - NORTHING: 2,229,409.02, EASTING: 6,094,340.60

[B] - NOTRHING: 2,229,447.85, EASTING: 6,094,331.01

2/7 INLET PLAN
SCALE: 1/4" = 1'-0"



4/- WARP APRON PROFILE (UPSTREAM)
SCALE: 3/8" = 1'-0"

100% SUBMITTAL

COUNTY OF ORANGE CALIFORNIA

MARK	DESCRIPTION	DATE	APPR.

PREPARED UNDER THE RESPONSIBLE CHARGE OF:

DATE

REGISTERED PROFESSIONAL ENGINEER JOSEPH F. LONG C 54329 Exp. 12-31-16 CIVIL STATE OF CALIFORNIA

COUNTY OF ORANGE
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ORANGE, CA 92868
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DESIGNED BY: DEREK S. PLAZA	
DRAWN BY: DCM	CHECKED BY: JFL
DRAWING CODE:	
FILE NAME:	
PLOT DATE: $DATE$	SCALE: AS SHOWN

CRAWFORD CANYON ROAD DRAINAGE IMPROVEMENTS AND CONSTRUCTION, PHASE 1 NEAR THE INTERSECTION OF CRAWFORD CANYON ROAD AND NEWPORT BOULEVARD

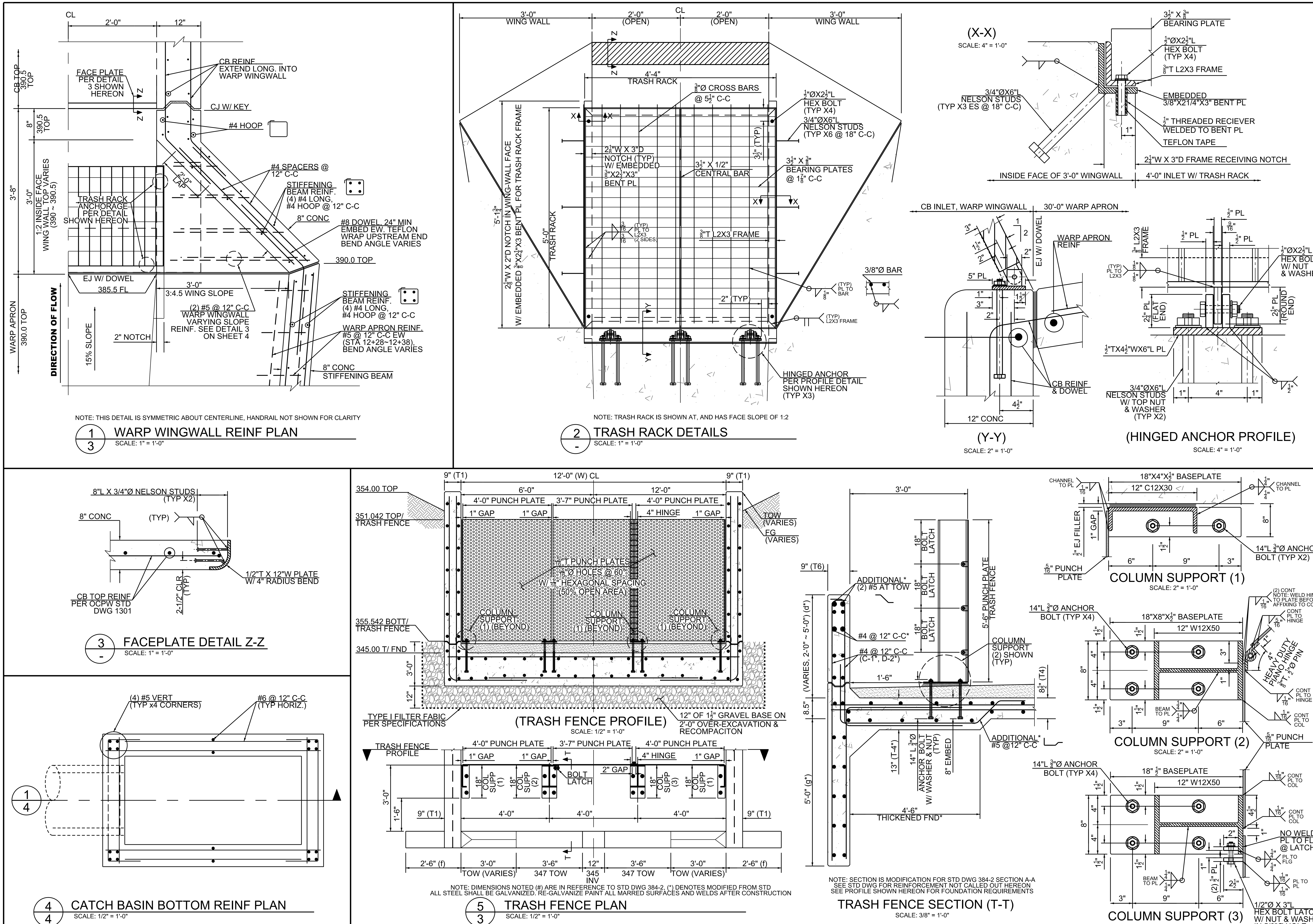
INLET STRUCTURE DETAILS

Sheet Reference Number

4

Sheet 4 of 8

FILE NAME:$FILE$



COUNTY OF ORANGE CALIFORNIA

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JOSEPH F. LONG C 54329 Exp. 12-31-16 CIVIL STATE OF CALIFORNIA REGISTERED PROFESSIONAL ENGINEER

DESIGNED BY: DEREK S. PLAZA

DRAWN BY: DCM

CHECKED BY: JFL

DRAWING CODE:

FILE NAME:

PLOT DATE: $DATE$

SCALE: AS SHOWN

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CRAWFORD CANYON ROAD DRAINAGE IMPROVEMENTS AND CONSTRUCTION, PHASE 1 NEAR THE INTERSECTION OF CRAWFORD CANYON ROAD AND NEWPORT BOULEVARD

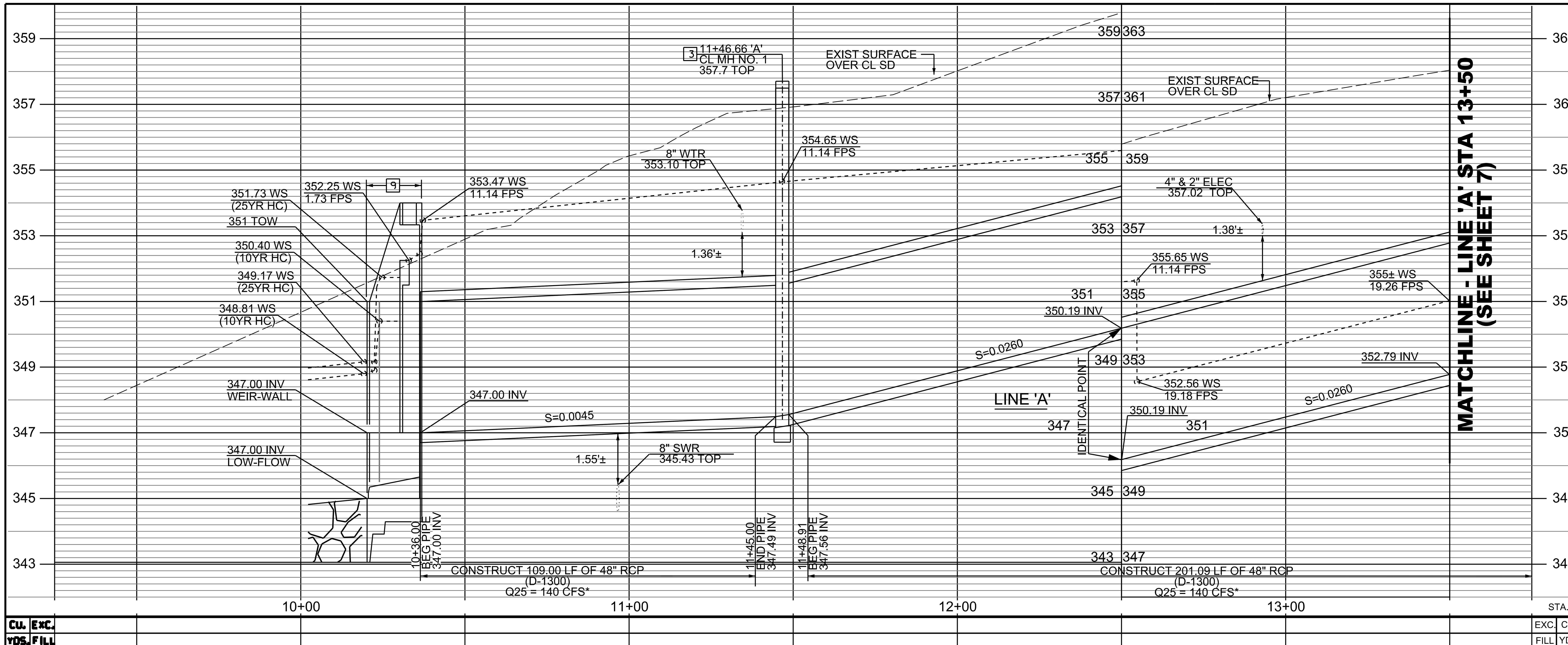
STANDARD DETAILS

Sheet Reference Number

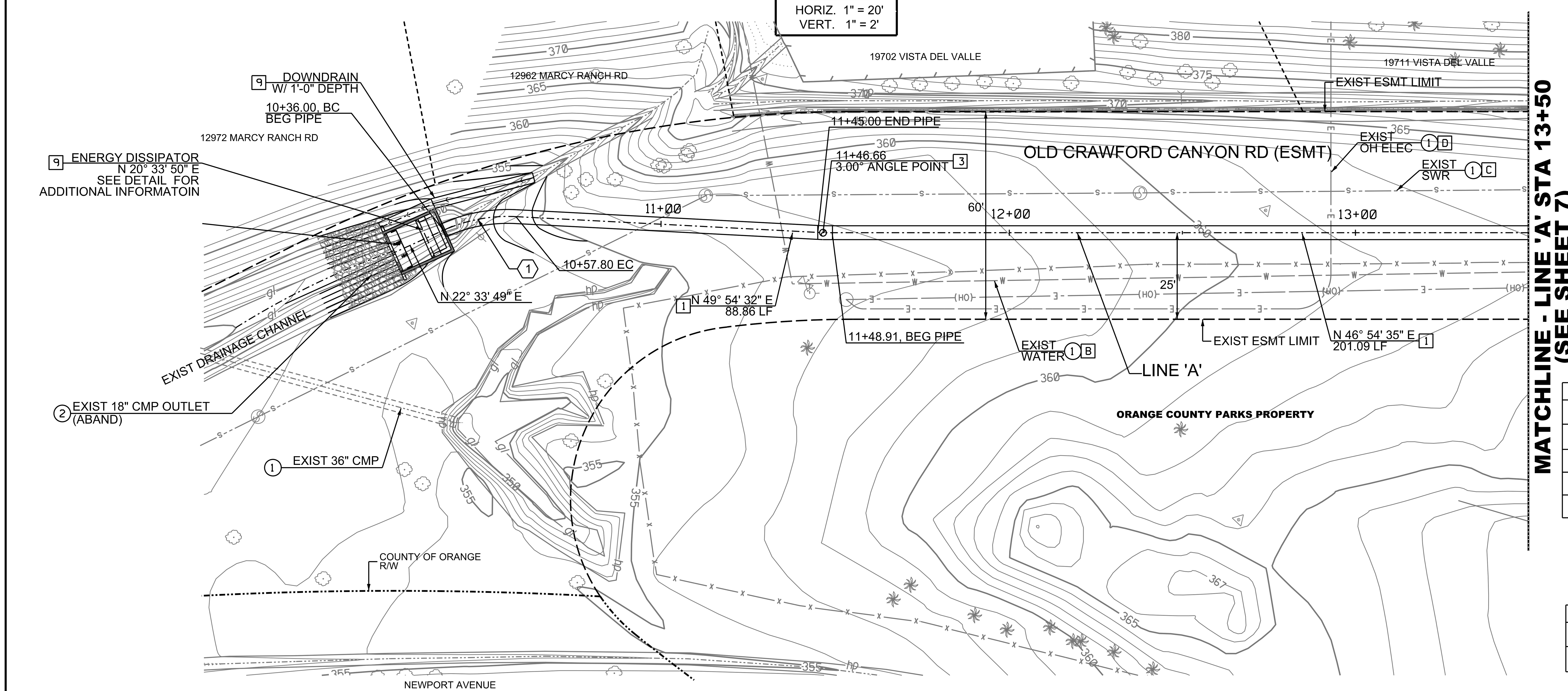
5

Sheet 5 of 8

FILE NAME:$FILE$



PROFILE
HORIZ. 1" = 20'
VERT. 1" = 2'



PLAN
1"=20'

CONSTRUCTION NOTES

1. CONSTRUCT 48" R.C.P. PER OCPW STD PLAN 1319 (D-LOAD PER PROFILE), SEE DETAIL 3 ON SHEET 3
2. CONSTRUCT 3'-0" WIDE DOWNDRAIN PER OCPW STD 1321 (1'-0 DEPTH)
3. INSTALL MANHOLE PER OCPW STD. NO. 320-2.
9. CONSTRUCT ENERGY DISSIPATOR PER DETAIL 2 ON SHEET 3

DISPOSITION

1. PROTECT IN PLACE
2. REMOVE INTERFERING PORTION

	UTILITY	OWNER
A	GAS LINE	SO. CAL. GAS
B	WATER	EAST ORANGE COUNTY WATER DIST. CITY OF ORANGE WATER DEPARTMENT
C	SEWER LINE	ORANGE COUNTY SANITATION DISTRICT
D	ELECTRIC LINE	SO. CALIF. EDISON
E	TELECOMM LINE	AT&T, COX COMMUNICATIONS, CHARTER

NOTES

* VALUES ARE FOR 25HC YR STORM EVENT OBTAINED FROM OCPW HYDROLOGY REPORT NO. F13-3 SIGNED BY EDITHA LLANES (AUGUST 2015)

HYDRAULIC DATA

STA TO STA	Q25 (CFS)	SECTION	S (FT/FT)	'n'	Dn (FT)	Vn (F/S)
(OUTLET)	140	TRAP. 1.5:1	0.01	0.078	4.17	3.27
(DISSIPATER)	140	RECT. b = 12'	0.02	0.013	0.87	13.44
10+36 - 11+48	140	48"Ø RCP	0.0045	0.013	1.90	23.73
11+48 - 13+50	140	48"Ø RCP	0.026	0.013	2.24	19.30

CURVE DATA

#	DELTA	RADIUS	LENGTH	TANGENT	BC	EC
1	27°20'42"	45'	21.80	11.23	10+36.00	10+69.29

100% SUBMITTAL

THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL

COUNTY OF ORANGE CALIFORNIA

MARK	DESCRIPTION	DATE	APPR.

PREPARED UNDER THE RESPONSIBLE CHARGE OF: DATE

REGISTERED PROFESSIONAL ENGINEER JOSEPH F. LONG C 54329 Exp. 12-31-16 CIVIL STATE OF CALIFORNIA

DESIGNED BY: DEREK S. PLAZA
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CHECKED BY: JFL
DRAWING CODE:
FILE NAME:
PLOT DATE: $DATE$
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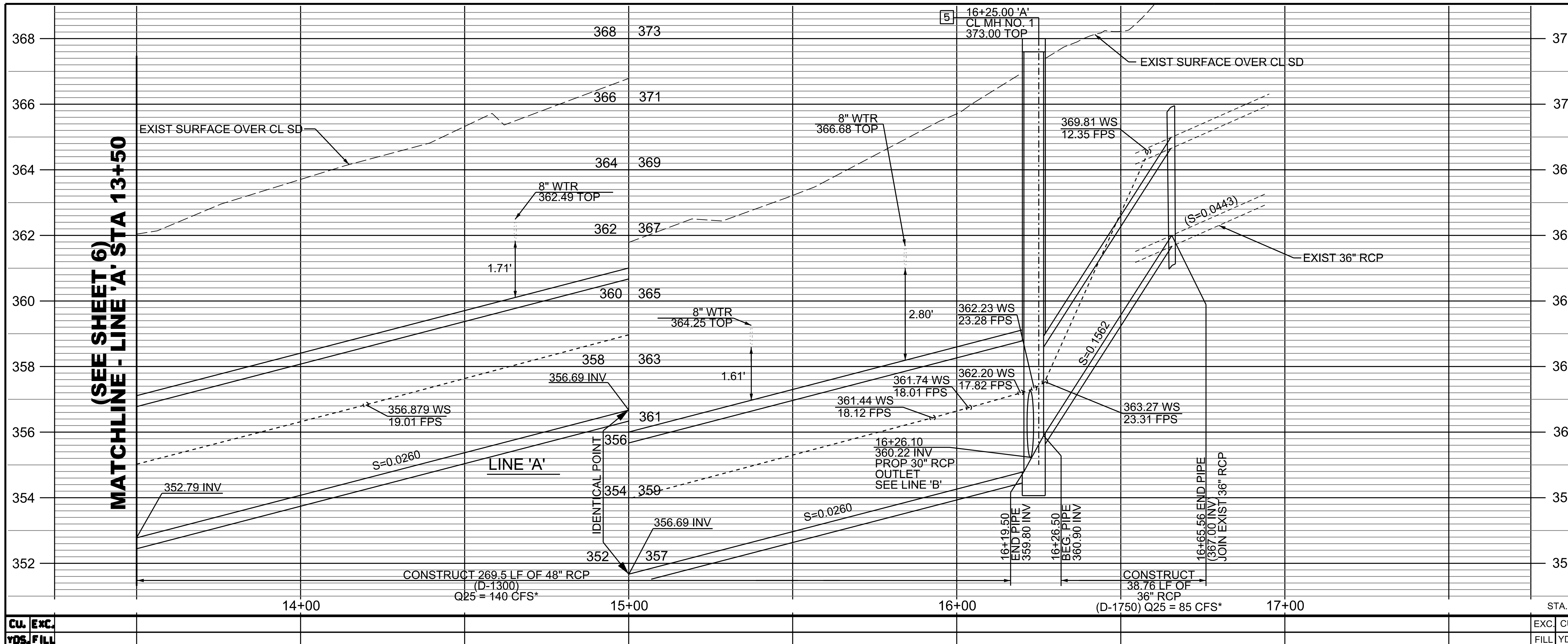
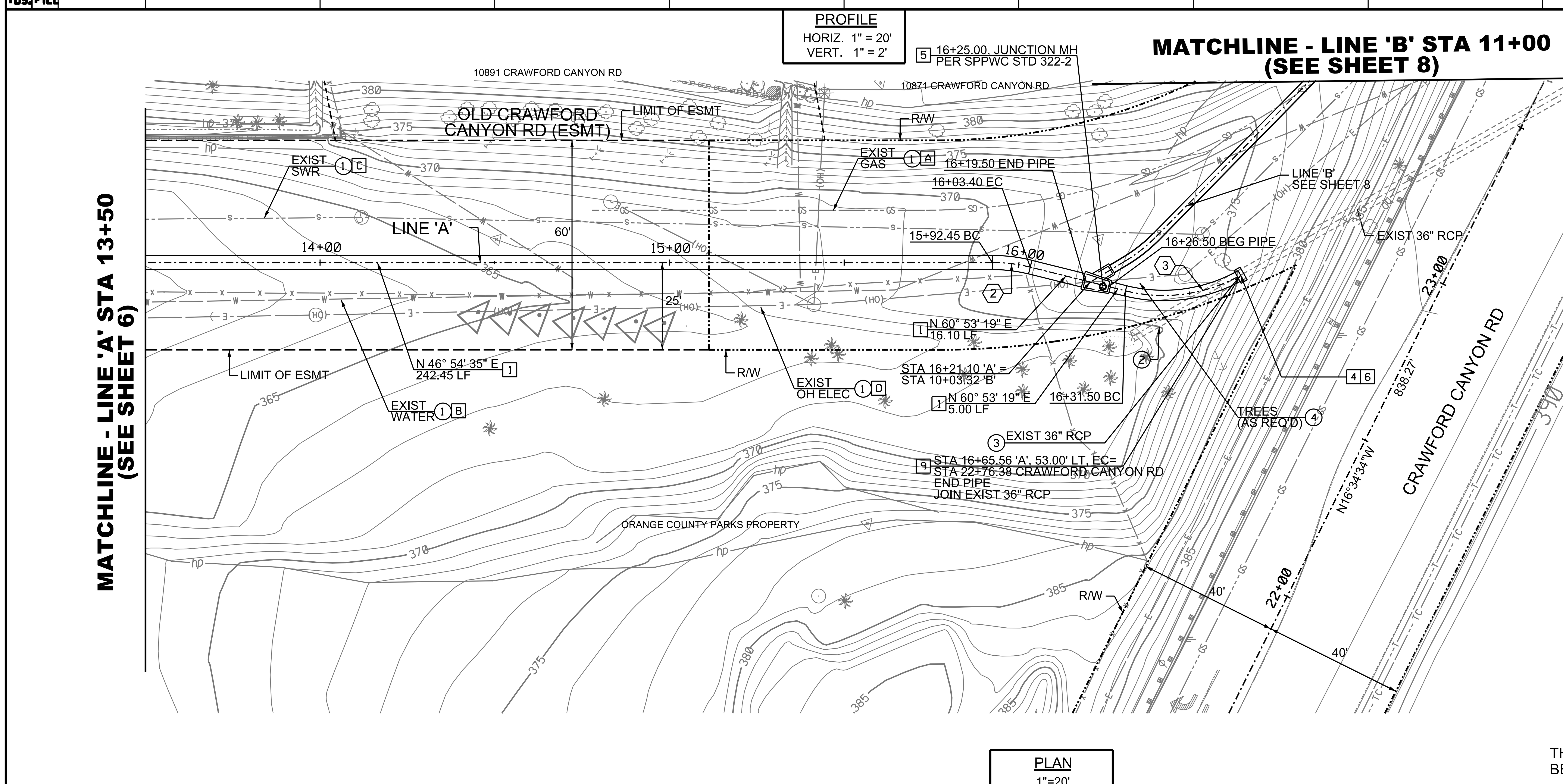
CRAWFORD CANYON ROAD DRAINAGE IMPROVEMENTS AND CONSTRUCTION, PHASE 1 NEAR THE INTERSECTION OF CRAWFORD CANYON ROAD AND NEWPORT BOULEVARD

PLAN AND PROFILE

Sheet Reference Number
6

FILE NAME:$FILEL$





CONSTRUCTION NOTES

1. CONSTRUCT 48" R.C.P. PER OCPW STD. PLAN 1319 (D-LOAD PER PROFILE), SEE DETAIL 3 ON SHEET 3
4. CONSTRUCT CONCRETE COLLAR PER OCPW STD. NO. 380-4
5. INSTALL 7' PIPE - TO - PIPE MANHOLE (LARGE SIDE INLET) PER OCPW STD. 322-2 WHERE ∠A = 45°, SEE DETAIL 1 ON SHEET 3
6. CONSTRUCT 36" R.C.P. PER OCPW STD. PLAN 1319 (D-LOAD PER PROFILE), SEE DETAIL 3 ON SHEET 3

DISPOSITION

1. PROTECT IN PLACE
2. REMOVE INTERFERING PORTION
3. ABANDON PORTION
4. REMOVE

UTILITY	OWNER
A GAS LINE	SO. CAL. GAS
B WATER	EAST ORANGE COUNTY WATER DIST. CITY OF ORANGE WATER DEPARTMENT
C SEWER LINE	ORANGE COUNTY SANITATION DISTRICT
D ELECTRIC LINE	SO. CALIF. EDISON
E TELECOMM LINE	AT&T, COX COMMUNICATIONS, CHARTER

NOTES

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HYDRAULIC DATA

STA TO STA	Q25 (CFS)	SECTION	S (FT/FT)	'n'	Dn (FT)	Vn (F/S)
13+50 - 16+19.50	140	48"Ø RCP	0.026	0.013	2.24	19.30
16+26.50 - 16+65	85	36"Ø RCP	0.1562	0.013	1.17	33.24

CURVE DATA

#	RADIUS	DELTA	LENGTH	TANGENT	BC	EC
2	13°56'31"	45'	10.95'	5.53'	15+92.45	16+03.40
3	43°21'60"	45'	34.06'	17.96'	16+31.50	16+65.56

100% SUBMITTAL

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COUNTY OF ORANGE CALIFORNIA

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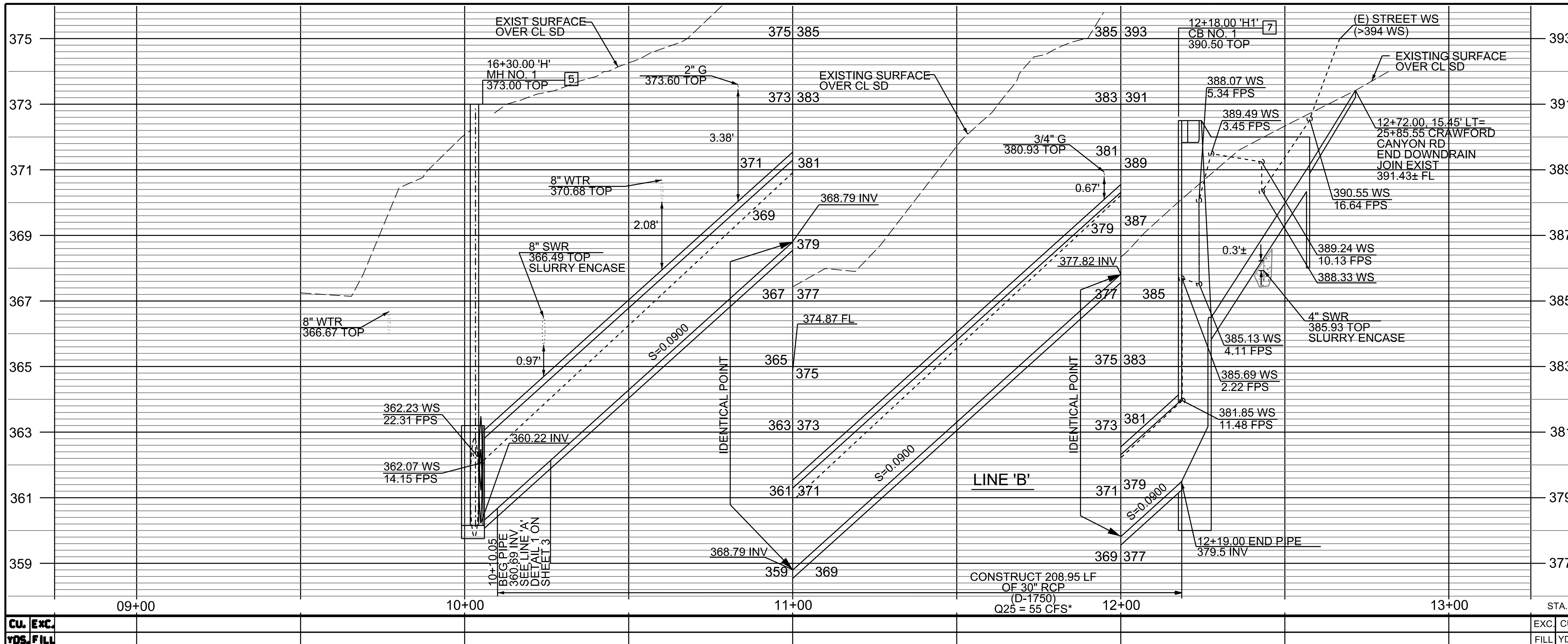
CRAWFORD CANYON ROAD DRAINAGE IMPROVEMENTS AND CONSTRUCTION, PHASE 1 NEAR THE INTERSECTION OF CRAWFORD CANYON ROAD AND NEWPORT BOULEVARD

PLAN AND PROFILE

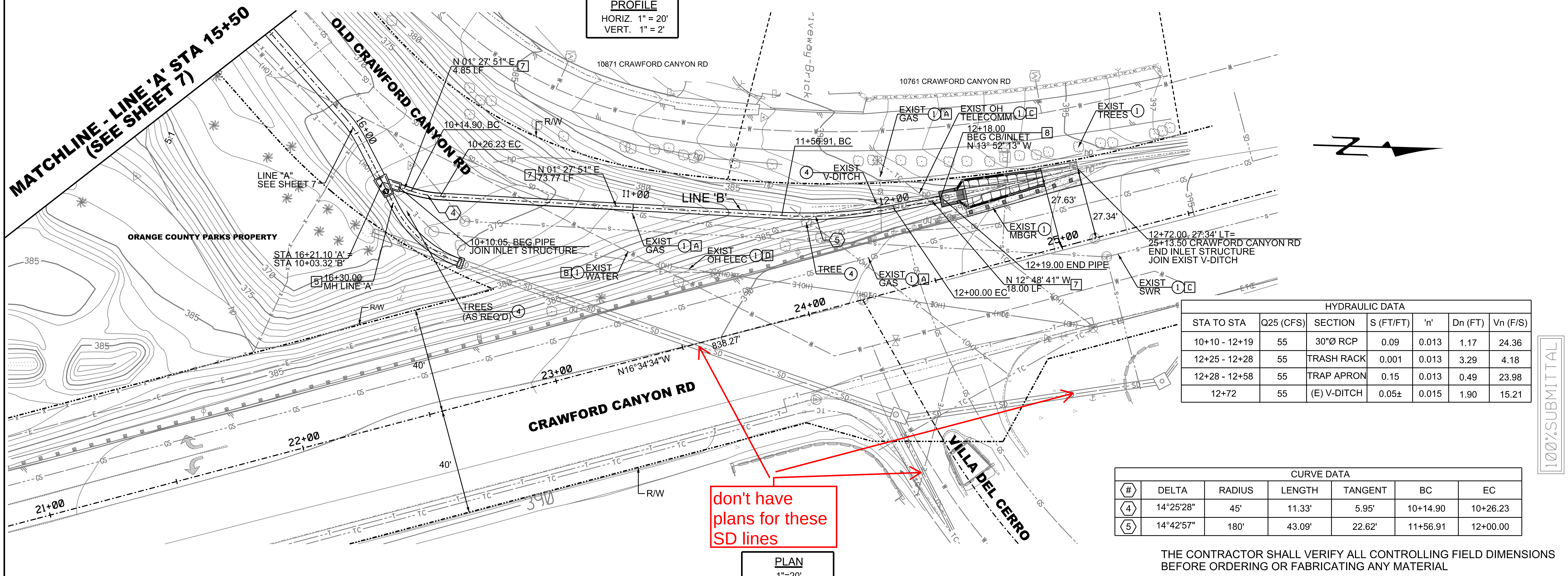
Sheet Reference Number

7

FILE NAME:$FILE$



PROFILE
HORIZ. 1" = 20'
VERT. 1" = 2'



PLAN
1"=20'

CONSTRUCTION NOTES

5. INSTALL 7' PIPE - TO - PIPE MANHOLE (LARGE SIDE INLET) PER OCPW STD. 322-2 WHERE ∠A = 45°, SEE DETAIL 1 ON SHEET 3
7. CONSTRUCT 30" R.C.P. PER OCPW STD. PLAN 1319 (D-LOAD PER PROFILE), SEE DETAIL 3 ON SHEET 3
8. CONSTRUCT INLET STRUCTURE WITH CATCH BASIN, WARPED WING WALLS, WARPED APRON, AND CONCRETE OVERLAY PER DETAIL 1 ON SHEET 4

DISPOSITION

1. PROTECT IN PLACE
4. REMOVE

UTILITY		OWNER
A	GAS LINE	SO. CAL. GAS
B	WATER	EAST ORANGE COUNTY WATER DIST. CITY OF ORANGE WATER DEPARTMENT
C	SEWER LINE	ORANGE COUNTY SANITATION DISTRICT
D	ELECTRIC LINE	SO. CALIF. EDISON
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NOTES

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HYDRAULIC DATA

STA TO STA	Q25 (CFS)	SECTION	S (FT/FT)	'n'	Dn (FT)	Vn (F/S)
10+10 - 12+19	55	30"Ø RCP	0.09	0.013	1.17	24.36
12+25 - 12+28	55	TRASH RACK	0.001	0.013	3.29	4.18
12+28 - 12+58	55	TRAP APRON	0.15	0.013	0.49	23.98
12+72	55	(E) V-DITCH	0.05±	0.015	1.90	15.21

CURVE DATA

#	DELTA	RADIUS	LENGTH	TANGENT	BC	EC
4	14°25'28"	45'	11.33'	5.95'	10+14.90	10+26.23
5	14°42'57"	180'	43.09'	22.62'	11+56.91	12+00.00

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PLAN AND PROFILE

Sheet Reference Number

8

Sheet 8 of 8

FILE NAME:$FILE$