Appendix J
Hydrology Report

ESA

PRELIMINARY HYDROLOGY REPORT

EF INTERNATIONAL LANGUAGE CAMPUS COSTA MESA 3150 BEAR STREET COSTA MESA , CA

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PROJECT MANAGER: Mark Nero

DATE PREPARED: August 2019

PROJECT NUMBER: 1793-001-01

full circle thinking®

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Project Number:

1793-001-01

EF INTERNATIONAL LANGUAGE CAMPUS COSTA MESA
3150 BEAR STREET

Costa Mesa, California

Supervising Engineer:

Mark Nero, P.E.

Date Prepared:

August 2019

Table of Contents

1.0 PROJECT DESCRIPTION 1

2.0 PROPOSED ON-SITE DRAINAGE FACILITIES 3

3.0 HYDROLOGY STUDY 4

3.1 Summary of Flows, 25-year event 4

4.0 CONCLUSIONS 6

APPENDICES

APPENDIX 1 Existing and Proposed Hydrology Studies
APPENDIX 2 Hydraulic Calculations
APPENDIX 3 Supporting Charts and Maps
APPENDIX 4 Hydrology Maps

1.0 PROJECT DESCRIPTION

The 6.1-acre site consists of an existing 4-story building with associated parking, outdoor gathering areas and miscellaneous facilities. The project proposes the current use be converted into a foreign language school with two additional new dormitory buildings to house students. This report considers the total site improvement study area as 6.7 acres, which includes a tributary offsite area on the west side of the property. This offsite area is the roadway abutment for Bear Avenue. The majority of the site other than the existing building and select utilities are proposed to be demolished.

The existing site flows are divided into four separate subareas labeled A, B, C and D.

Subarea A consists of the existing utility buildings structure, landscape areas and parking areas in the southeast quadrant of the site. This subarea has two drain inlets that collect the surface runoff and direct it to an 18" pipe that directs the flow west into subarea C. Overflow is directed north, via overland flow, into subarea D.

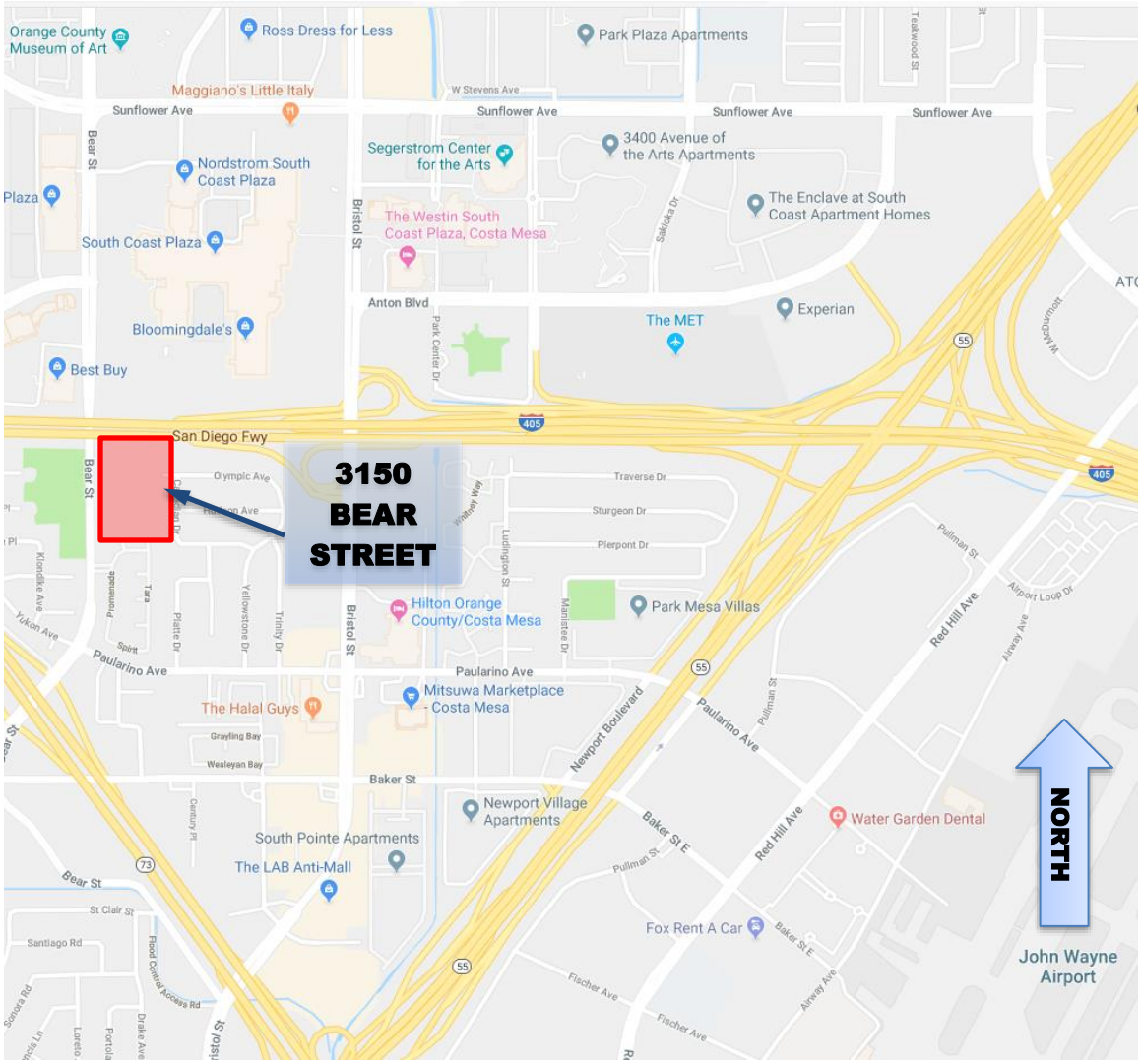
Subarea B consists of the southerly portion of the existing building, the outdoor gathering areas, landscape areas and parking areas in the middle and the entry at the southwest corner of the site. This subarea has one main drain inlet and numerous smaller drain inlets that collect the surface runoff and direct it to either a 12" pipe or an 18" pipe that takes the flow north or west into subarea C. Overflow travels north or west into subarea C via overland flow.

Subarea C consists of the southwest portion of the existing building, a portion of the outdoor gathering areas, landscape areas and parking areas in the southwest corner of the site. The subarea has two drain inlets that collect the surface runoff and direct it to a 24" pipe that takes the flow north into subarea D. Any overflow would travel north into subarea D or offsite west into the existing inlet located at the toe of the embankment slope of Bear Street, which connects to the existing 27" pipe that flows north.

Subarea D consists of a portion of the existing building, landscape areas and parking areas on the north side of the site. The subarea has one drain inlet that collects a smaller portion the surface runoff and directs it to a 12" pipe that takes the flow west into the adjacent right of way and the inlet located just east of the Bear Street bridge's southern abutment. The largest portion of the subareas surface runoff is directed to a curb opening in the middle of the north side of the site, which has a direct connection the San Diego Freeway's south side concrete trapezoidal channel via a concrete apron. This channel then flows west. Any overflow would travel north into the freeway right of way and then flow slowly west. See the existing hydrology map in Appendix 4.

The project is located in flood zone 'X' per FEMA Flood Insurance Rate Map (FIRM) No. 06059C0267J, revised December 3, 2009. Flood zone 'X' corresponds to areas outside the 500-year flood. See FEMA FIRMETTE in Appendix 3.

Project Site Location Map



2.0 PROPOSED ON-SITE DRAINAGE FACILITIES

The purpose of this report to determine the feasibility of the proposed drainage facilities. Detailed design that can be used for construction will be provided in the final report.

This project will provide water quality treatment to the low flows within the limits of the project. See project water quality management plan. The proposed improvements include proposed inlets to collect the runoff for water quality treatment. The site is graded to provided secondary flow paths for runoff from events exceeding the major storm event.

Proposed subarea A is in the southeast corner of the site. It includes the proposed building 3, parking areas, landscape areas and some recreational areas. There are three proposed inlets that the run-off is directed towards, with only one inlet collecting most of the runoff. The runoff collected by these inlets is conveyed via pipes into subarea B. The low flow runoff is directed to a Modular Wetland Systems (MWS) unit or a bio swale for water quality treatment. Refer to the proposed Hydrology Map provided in Appendix 4.

Proposed subarea B is in the southwest corner of the site. It includes the proposed parking areas, landscape areas and the entrance area to the site. There are four proposed inlets that the run-off is directed towards, with one inlet collecting most of the runoff. The runoff collected by these inlets is conveyed via pipes into subarea C. The low flow runoff is directed to MWS units for water quality treatment. Refer to the proposed Hydrology map provided in Appendix 4.

Proposed subarea C is located on the mid-west side of the site. It includes the proposed building 2, parking areas, landscape areas and most of the recreational area. There are nine proposed inlets that the run-off is directed towards, two of which collect most of the runoff. The runoff collected by these inlets is conveyed via a system of pipes, including the existing 24" pipe into subarea D. The low flow runoff is directed to MWS units or to a bio swale for water quality treatment. Refer to the proposed Hydrology map provided in Appendix 4.

Proposed subarea D is located on the north half of the site. It includes the existing building, future building 1, proposed parking areas, landscape areas and outdoor gathering areas. There are two proposed inlets that the run-off is directed towards and one concrete spillway that is collecting most of the runoff but is slightly elevated above the MWS unit so that low flows are directed to the treatment BMP. The runoff collected by these inlets is conveyed via pipes to join the existing 24" pipe from subarea C and then conveyed by a 27" pipe into subarea OS. The concrete spillway directs the runoff north into the freeway right of way to the existing concrete channel, matching historic drainage patterns. The low flow runoff is directed to MWS units for water quality treatment. Refer to the proposed Hydrology map provided in Appendix 4.

The subareas A, B and C can be described as in a quasi-sump condition as they all have a secondary flow path and are not critical to any structure. These subareas have their secondary flow path north into subarea D. Subarea D's secondary flow path is north and offsite into the freeway right of way. The proposed development maintains the general historic drainage patterns and places no significant flow rate increases.

3.0 HYDROLOGY STUDY

The proposed runoff from the developed area is less than the existing runoff for the 25-year storm event analyzed, see the summary table below. The existing and proposed subareas both maintain similar drainage patterns. The site drains on the surface north and in pipes northwest. All the analyzed subarea flows are combined at node 51 along with the offsite flows from the freeway right of way and the South Coast Plaza shopping area. These combined flows are conveyed west under Bear Street in an existing 72-inch pipe to the Gisler Storm Channel. This channel flows into the Greenville Banning Channel which directly connects to the Santa Ana River Channel. Refer to Appendix 3 for the watershed map.

The proposed improvements have been analyzed as 4 subareas to determine runoff due to the preliminary nature of this report. It is anticipated that the final report will use smaller subareas to determine flows for the water quality and quasi-sump inlet facilities of the site.

The proposed drain system(s) will be designed to be consistent with the following goals and guidelines as presented in the Orange County Hydrology Manual.

Onsite design storm is based on the 25-year event for overflow since the subareas are only in a quasi-sump condition. All inlets and appurtenant piping will be designed in conformance with the Orange County Hydraulics manual.

All habitable buildings shall be protected from flooding during a 100-year frequency storm. This site is in flood zone 'X' per FEMA maps and flooding is not considered an issue on this site. (See section 1.0)

Recommended design water surface elevations inside area drains shall be 0.5' below inlet grate elevation when possible.

Pipe size may not be decreased downstream without the City's approval.

Branching of flow is not allowed.

AES software was used to determine the proposed storm runoff at the 25-year event level. See Appendices 2 for calculations.

3.1 SUMMARY OF FLOWS, 25-YEAR EVENT

EXISTING

	Area ID (Node)	Area (Acres)	25yr Flow (cfs)	Notes
	A	1.4	5.1	
	B	1.2	9.5	Confluence T_C = 5.5 min
	C	1.3	14.4	
	D	2.3	7.3	Total existing site flow = **21.7** cfs
OFFSITE	OS	0.6	2.5	

PROPOSED

	Area ID (Node)	Area (Acres)	25yr Flow (cfs)	Notes
	A	1.6	5.0	
	B	0.6	6.2	Confluence T_C = 11.7 min
	C	1.5	11.0	
	D	2.4	8.7	Total proposed site flow = **19.7** cfs
OFFSITE	OS	0.6	2.5	

4.0 CONCLUSIONS

The analysis provided in this report provides the following conclusions:

1. The project is feasible from a drainage standpoint and will have less than a significant impact on the existing storm drain infrastructure. See discussion in sections 2.0 and 3.0 for discussions of drainage facilities and project impacts.
2. The project is protected from flooding providing secondary overflow paths to inlets in quasi-sump conditions.

These results indicate that the proposed project can be constructed in a manner that minimizes the impact of the proposed storm flow to the existing surrounding areas and neighborhood while providing safe and adequate drainage operation for the proposed project.

APPENDIX 1

Existing and Proposed Hydrology Studies

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2014 Advanced Engineering Software (aes)
             Ver. 21.0  Release Date: 06/01/2014  License ID 1355

                          Analysis prepared by:

                            Fuscoe Engineering
                           16795 Von Karman Ave
                                 Ste 100
                             Irvine, CA 92606

 ************************* DESCRIPTION OF STUDY *************************
* EF COSTA MESA                                                         *
* EXISTING 10 YEAR                                                      *
* PN 1793-01                                                            *
 ************************************************************************

  FILE NAME: E10.DAT
  TIME/DATE OF STUDY: 11:25 08/21/2019
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *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 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *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) =   210.00
  ELEVATION DATA: UPSTREAM(FEET) =     36.30  DOWNSTREAM(FEET) =     33.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.628
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.454
  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.)
```

```
  MOBILE HOME PARK           D        1.40      0.20     0.250    75    6.63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.250
  SUBAREA RUNOFF(CFS) =      4.29
  TOTAL AREA(ACRES) =      1.40   PEAK FLOW RATE(CFS) =      4.29

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     31.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    28.50  DOWNSTREAM(FEET) =    25.20
  FLOW LENGTH(FEET) =   290.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.68
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.29
  PIPE TRAVEL TIME(MIN.) =   0.85    Tc(MIN.) =    7.48
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     31.00 =     500.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     31.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.48
  RAINFALL INTENSITY(INCH/HR) =   3.22
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.25
  EFFECTIVE STREAM AREA(ACRES) =       1.40
  TOTAL STREAM AREA(ACRES) =       1.40
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.29

****************************************************************************
  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) =   170.00
  ELEVATION DATA: UPSTREAM(FEET) =     38.30  DOWNSTREAM(FEET) =     33.10

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.265
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.941
  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.)
  MOBILE HOME PARK           D        1.20      0.20     0.250    75    5.27
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.250
  SUBAREA RUNOFF(CFS) =      4.20
  TOTAL AREA(ACRES) =      1.20   PEAK FLOW RATE(CFS) =      4.20

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     31.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    30.40  DOWNSTREAM(FEET) =    25.20
  FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.82
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.20
  PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =    5.53
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     31.00 =     310.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     31.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
==============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.53
  RAINFALL INTENSITY(INCH/HR) =   3.83
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.25
  EFFECTIVE STREAM AREA(ACRES) =       1.20
  TOTAL STREAM AREA(ACRES) =       1.20
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.20

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        4.29    7.48    3.223  0.20( 0.05) 0.25       1.4      10.00
      2        4.20    5.53    3.832  0.20( 0.05) 0.25       1.2      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        7.98    5.53    3.832  0.20( 0.05) 0.25       2.2      20.00
      2        7.81    7.48    3.223  0.20( 0.05) 0.25       2.6      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       7.98    Tc(MIN.) =     5.53
  EFFECTIVE AREA(ACRES) =       2.24   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.25
  TOTAL AREA(ACRES) =        2.6
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     31.00 =     500.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  82
----------------------------------------------------------------------------
  >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
  >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   240.00
  ELEVATION DATA: UPSTREAM(FEET) =     36.90  DOWNSTREAM(FEET) =     33.10

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.648
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.448
  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.)
  APARTMENTS                D        1.30      0.20     0.200    75    6.65
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.30   INITIAL SUBAREA RUNOFF(CFS) =    3.99

  ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
  MAINLINE Tc(MIN.) =    5.53
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.832
  SUBAREA AREA(ACRES) =    1.30      SUBAREA RUNOFF(CFS) =    4.44
  EFFECTIVE AREA(ACRES) =      3.54   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.23
  TOTAL AREA(ACRES) =        3.9       PEAK FLOW RATE(CFS) =      12.04

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     42.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    25.20  DOWNSTREAM(FEET) =    21.70
  FLOW LENGTH(FEET) =   410.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.50
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.04
  PIPE TRAVEL TIME(MIN.) =   1.05    Tc(MIN.) =    6.58
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     42.00 =     910.00 FEET.

****************************************************************************
  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) =   290.00
  ELEVATION DATA: UPSTREAM(FEET) =     36.20  DOWNSTREAM(FEET) =     31.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.311
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.034
  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
  "8-10 DWELLINGS/ACRE"      D        2.30      0.20     0.400    75    8.31
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  SUBAREA RUNOFF(CFS) =      6.11
  TOTAL AREA(ACRES) =      2.30   PEAK FLOW RATE(CFS) =      6.11
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.3  TC(MIN.) =      8.31
  EFFECTIVE AREA(ACRES) =      2.30  AREA-AVERAGED Fm(INCH/HR)=  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.400
  PEAK FLOW RATE(CFS)   =       6.11
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2014 Advanced Engineering Software (aes)
             Ver. 21.0  Release Date: 06/01/2014  License ID 1355

                          Analysis prepared by:

                            Fuscoe Engineering
                           16795 Von Karman Ave
                                 Ste 100
                             Irvine, CA 92606

 ************************** DESCRIPTION OF STUDY **************************
* EF COSTA MESA                                                            *
* EXISTING 25 YEAR                                                         *
* PN 1793-01                                                               *
 ***************************************************************************

  FILE NAME: E25.DAT
  TIME/DATE OF STUDY: 10:40 08/21/2019
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *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 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *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) =   210.00
  ELEVATION DATA: UPSTREAM(FEET) =     36.30  DOWNSTREAM(FEET) =     33.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.628
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.112
  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.)
```

```
  MOBILE HOME PARK           D        1.40      0.20     0.250    75    6.63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.250
  SUBAREA RUNOFF(CFS) =      5.12
  TOTAL AREA(ACRES) =      1.40   PEAK FLOW RATE(CFS) =      5.12

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     31.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    28.50  DOWNSTREAM(FEET) =    25.20
  FLOW LENGTH(FEET) =   290.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.89
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.12
  PIPE TRAVEL TIME(MIN.) =   0.82    Tc(MIN.) =    7.45
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     31.00 =     500.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     31.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.45
  RAINFALL INTENSITY(INCH/HR) =   3.85
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.25
  EFFECTIVE STREAM AREA(ACRES) =       1.40
  TOTAL STREAM AREA(ACRES) =       1.40
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.12

****************************************************************************
  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) =   170.00
  ELEVATION DATA: UPSTREAM(FEET) =     38.30  DOWNSTREAM(FEET) =     33.10

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.265
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.685
  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.)
  MOBILE HOME PARK           D        1.20      0.20     0.250    75    5.27
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.250
  SUBAREA RUNOFF(CFS) =      5.01
  TOTAL AREA(ACRES) =      1.20   PEAK FLOW RATE(CFS) =      5.01

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     31.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    30.40  DOWNSTREAM(FEET) =    25.20
  FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.15
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.01
  PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =    5.52
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     31.00 =     310.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     31.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
==============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.52
  RAINFALL INTENSITY(INCH/HR) =   4.56
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.25
  EFFECTIVE STREAM AREA(ACRES) =       1.20
  TOTAL STREAM AREA(ACRES) =       1.20
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.01

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        5.12    7.45    3.850  0.20( 0.05) 0.25       1.4      10.00
      2        5.01    5.52    4.561  0.20( 0.05) 0.25       1.2      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        9.51    5.52    4.561  0.20( 0.05) 0.25       2.2      20.00
      2        9.33    7.45    3.850  0.20( 0.05) 0.25       2.6      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       9.51    Tc(MIN.) =     5.52
  EFFECTIVE AREA(ACRES) =       2.24   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.25
  TOTAL AREA(ACRES) =        2.6
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     31.00 =     500.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  82
----------------------------------------------------------------------------
  >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
  >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   240.00
  ELEVATION DATA: UPSTREAM(FEET) =     36.90  DOWNSTREAM(FEET) =     33.10

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.648
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.105
  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.)
  APARTMENTS                D        1.30      0.20     0.200    75    6.65
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.30   INITIAL SUBAREA RUNOFF(CFS) =    4.76

  ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
  MAINLINE Tc(MIN.) =    5.52
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.561
  SUBAREA AREA(ACRES) =    1.30      SUBAREA RUNOFF(CFS) =    5.29
  EFFECTIVE AREA(ACRES) =      3.54   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.23
  TOTAL AREA(ACRES) =        3.9       PEAK FLOW RATE(CFS) =      14.37

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     42.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    25.20  DOWNSTREAM(FEET) =    21.70
  FLOW LENGTH(FEET) =   410.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.88
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      14.37
  PIPE TRAVEL TIME(MIN.) =   0.99    Tc(MIN.) =    6.51
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     42.00 =     910.00 FEET.

****************************************************************************
  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) =   290.00
  ELEVATION DATA: UPSTREAM(FEET) =     36.20  DOWNSTREAM(FEET) =     31.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.311
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.618
  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
  "8-10 DWELLINGS/ACRE"      D        2.30      0.20     0.400    75    8.31
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  SUBAREA RUNOFF(CFS) =      7.32
  TOTAL AREA(ACRES) =      2.30   PEAK FLOW RATE(CFS) =      7.32
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.3  TC(MIN.) =      8.31
  EFFECTIVE AREA(ACRES) =      2.30  AREA-AVERAGED Fm(INCH/HR)=  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.400
  PEAK FLOW RATE(CFS)   =       7.32
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2014 Advanced Engineering Software (aes)
             Ver. 21.0  Release Date: 06/01/2014  License ID 1355

                          Analysis prepared by:

                            Fuscoe Engineering
                           16795 Von Karman Ave
                                 Ste 100
                             Irvine, CA 92606

 ************************* DESCRIPTION OF STUDY *************************
* EF COSTA MESA                                                          *
* PROPOSED 10 YEAR                                                       *
* PN 1793-01                                                             *
 ************************************************************************

  FILE NAME: P10.DAT
  TIME/DATE OF STUDY: 11:26 08/21/2019
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *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) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =     36.20  DOWNSTREAM(FEET) =     32.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.687
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.958
  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.)
```

```
  CONDOMINIUMS                D        1.60      0.20     0.350    75    8.69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA RUNOFF(CFS) =      4.16
  TOTAL AREA(ACRES) =      1.60   PEAK FLOW RATE(CFS) =      4.16

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     21.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    28.50  DOWNSTREAM(FEET) =    26.40
  FLOW LENGTH(FEET) =   420.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  11.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.02
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.16
  PIPE TRAVEL TIME(MIN.) =   1.74    Tc(MIN.) =   10.43
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     21.00 =     720.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  82
----------------------------------------------------------------------------
  >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
  >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   170.00
  ELEVATION DATA: UPSTREAM(FEET) =     38.30  DOWNSTREAM(FEET) =     34.60

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.435
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.870
  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.)
  APARTMENTS                  D        0.60      0.20     0.200    75    5.43
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.60   INITIAL SUBAREA RUNOFF(CFS) =    2.07

  ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
  MAINLINE Tc(MIN.) =   10.43
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.664
  SUBAREA AREA(ACRES) =    0.60      SUBAREA RUNOFF(CFS) =    1.42
  EFFECTIVE AREA(ACRES) =      2.20   AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.31
  TOTAL AREA(ACRES) =        2.2       PEAK FLOW RATE(CFS) =       5.15

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     32.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    26.40  DOWNSTREAM(FEET) =    23.40
  FLOW LENGTH(FEET) =   440.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.92
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.15
  PIPE TRAVEL TIME(MIN.) =   1.49    Tc(MIN.) =   11.92
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     32.00 =    1160.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE     32.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.92
  RAINFALL INTENSITY(INCH/HR) =   2.47
  AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.31
  EFFECTIVE STREAM AREA(ACRES) =       2.20
  TOTAL STREAM AREA(ACRES) =       2.20
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.15

****************************************************************************
  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) =   110.00
  ELEVATION DATA: UPSTREAM(FEET) =     36.90  DOWNSTREAM(FEET) =     35.10

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  4.060
  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.)
  APARTMENTS                 D        1.50      0.20     0.200    75    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      5.43
  TOTAL AREA(ACRES) =      1.50   PEAK FLOW RATE(CFS) =      5.43

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    31.50  DOWNSTREAM(FEET) =    23.40
  FLOW LENGTH(FEET) =   300.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   9.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.06
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.43
  PIPE TRAVEL TIME(MIN.) =   0.62    Tc(MIN.) =    5.62
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =     410.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE     32.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.62
  RAINFALL INTENSITY(INCH/HR) =   3.80
```

```
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       1.50
  TOTAL STREAM AREA(ACRES) =       1.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.43

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        5.15   11.92    2.467  0.20( 0.06) 0.31       2.2      10.00
      2        5.43    5.62    3.796  0.20( 0.04) 0.20       1.5      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        9.20    5.62    3.796  0.20( 0.05) 0.24       2.5      30.00
      2        8.66   11.92    2.467  0.20( 0.05) 0.26       3.7      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       9.20    Tc(MIN.) =     5.62
  EFFECTIVE AREA(ACRES) =       2.54   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.24
  TOTAL AREA(ACRES) =        3.7
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     32.00 =    1160.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE     42.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    23.40  DOWNSTREAM(FEET) =    21.70
  FLOW LENGTH(FEET) =   180.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  14.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.23
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.20
  PIPE TRAVEL TIME(MIN.) =   0.48    Tc(MIN.) =    6.10
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     42.00 =    1340.00 FEET.

****************************************************************************
  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) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =     36.20  DOWNSTREAM(FEET) =     31.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.195
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.295
  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.)
  APARTMENTS                 D        2.50      0.20     0.200    75    7.19
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      7.32
```

```
  TOTAL AREA(ACRES) =      2.50   PEAK FLOW RATE(CFS) =      7.32

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     51.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   110.00
  ELEVATION DATA: UPSTREAM(FEET) =     54.00  DOWNSTREAM(FEET) =     28.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  4.060
  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
  ".4 DWELLING/ACRE"         D        0.60      0.20     0.900    75    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.900
  SUBAREA RUNOFF(CFS) =      2.09
  TOTAL AREA(ACRES) =      0.60   PEAK FLOW RATE(CFS) =      2.09
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.6  TC(MIN.) =      5.00
  EFFECTIVE AREA(ACRES) =      0.60  AREA-AVERAGED Fm(INCH/HR)=  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.900
  PEAK FLOW RATE(CFS)   =       2.09
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2014 Advanced Engineering Software (aes)
             Ver. 21.0  Release Date: 06/01/2014  License ID 1355

                          Analysis prepared by:

                            Fuscoe Engineering
                           16795 Von Karman Ave
                                 Ste 100
                             Irvine, CA 92606

 ************************** DESCRIPTION OF STUDY **************************
* EF COSTA MESA                                                            *
* PROPOSED 25 YEAR                                                         *
* PN 1793-01                                                               *
 ***************************************************************************

  FILE NAME: P25.DAT
  TIME/DATE OF STUDY: 10:42 08/21/2019
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *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) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =     36.20  DOWNSTREAM(FEET) =     32.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.687
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.529
  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.)
```

```
  CONDOMINIUMS                D        1.60      0.20     0.350    75    8.69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA RUNOFF(CFS) =      4.98
  TOTAL AREA(ACRES) =      1.60   PEAK FLOW RATE(CFS) =      4.98

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     21.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    28.50  DOWNSTREAM(FEET) =    26.40
  FLOW LENGTH(FEET) =   420.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.32
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.98
  PIPE TRAVEL TIME(MIN.) =   1.62    Tc(MIN.) =   10.31
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     21.00 =     720.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  82
----------------------------------------------------------------------------
  >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
  >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   170.00
  ELEVATION DATA: UPSTREAM(FEET) =     38.30  DOWNSTREAM(FEET) =     34.60

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.435
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.601
  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.)
  APARTMENTS                  D        0.60      0.20     0.200    75    5.43
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    0.60   INITIAL SUBAREA RUNOFF(CFS) =    2.46

  ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
  MAINLINE Tc(MIN.) =   10.31
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.203
  SUBAREA AREA(ACRES) =    0.60      SUBAREA RUNOFF(CFS) =    1.71
  EFFECTIVE AREA(ACRES) =      2.20   AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.31
  TOTAL AREA(ACRES) =        2.2       PEAK FLOW RATE(CFS) =       6.22

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     32.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    26.40  DOWNSTREAM(FEET) =    23.40
  FLOW LENGTH(FEET) =   440.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.12
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.22
  PIPE TRAVEL TIME(MIN.) =   1.43    Tc(MIN.) =   11.74
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     32.00 =    1160.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE     32.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.74
  RAINFALL INTENSITY(INCH/HR) =   2.98
  AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.31
  EFFECTIVE STREAM AREA(ACRES) =       2.20
  TOTAL STREAM AREA(ACRES) =       2.20
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.22

****************************************************************************
  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) =   110.00
  ELEVATION DATA: UPSTREAM(FEET) =     36.90  DOWNSTREAM(FEET) =     35.10

  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.)
  APARTMENTS                 D        1.50      0.20     0.200    75    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      6.46
  TOTAL AREA(ACRES) =      1.50   PEAK FLOW RATE(CFS) =      6.46

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    31.50  DOWNSTREAM(FEET) =    23.40
  FLOW LENGTH(FEET) =   300.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.71
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.46
  PIPE TRAVEL TIME(MIN.) =   0.57    Tc(MIN.) =    5.57
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =     410.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE     32.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.57
  RAINFALL INTENSITY(INCH/HR) =   4.54
```

```
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       1.50
  TOTAL STREAM AREA(ACRES) =       1.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.46

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        6.22   11.74    2.976  0.20( 0.06) 0.31       2.2      10.00
      2        6.46    5.57    4.536  0.20( 0.04) 0.20       1.5      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       10.99    5.57    4.536  0.20( 0.05) 0.24       2.5      30.00
      2       10.44   11.74    2.976  0.20( 0.05) 0.26       3.7      10.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      10.99    Tc(MIN.) =     5.57
  EFFECTIVE AREA(ACRES) =       2.54   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.24
  TOTAL AREA(ACRES) =        3.7
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     32.00 =    1160.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE     42.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    23.40  DOWNSTREAM(FEET) =    21.70
  FLOW LENGTH(FEET) =   180.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.67
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.99
  PIPE TRAVEL TIME(MIN.) =   0.45    Tc(MIN.) =    6.02
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     42.00 =    1340.00 FEET.

****************************************************************************
  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) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =     36.20  DOWNSTREAM(FEET) =     31.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.195
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.926
  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.)
  APARTMENTS                 D        2.50      0.20     0.200    75    7.19
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      8.74
```

```
  TOTAL AREA(ACRES) =      2.50   PEAK FLOW RATE(CFS) =      8.74

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     51.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   110.00
  ELEVATION DATA: UPSTREAM(FEET) =     54.00  DOWNSTREAM(FEET) =     28.00

  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.)
  RESIDENTIAL
  ".4 DWELLING/ACRE"         D        0.60      0.20     0.900    75    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.900
  SUBAREA RUNOFF(CFS) =      2.51
  TOTAL AREA(ACRES) =      0.60   PEAK FLOW RATE(CFS) =      2.51
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.6  TC(MIN.) =      5.00
  EFFECTIVE AREA(ACRES) =      0.60  AREA-AVERAGED Fm(INCH/HR)=  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.900
  PEAK FLOW RATE(CFS)   =       2.51
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX 2

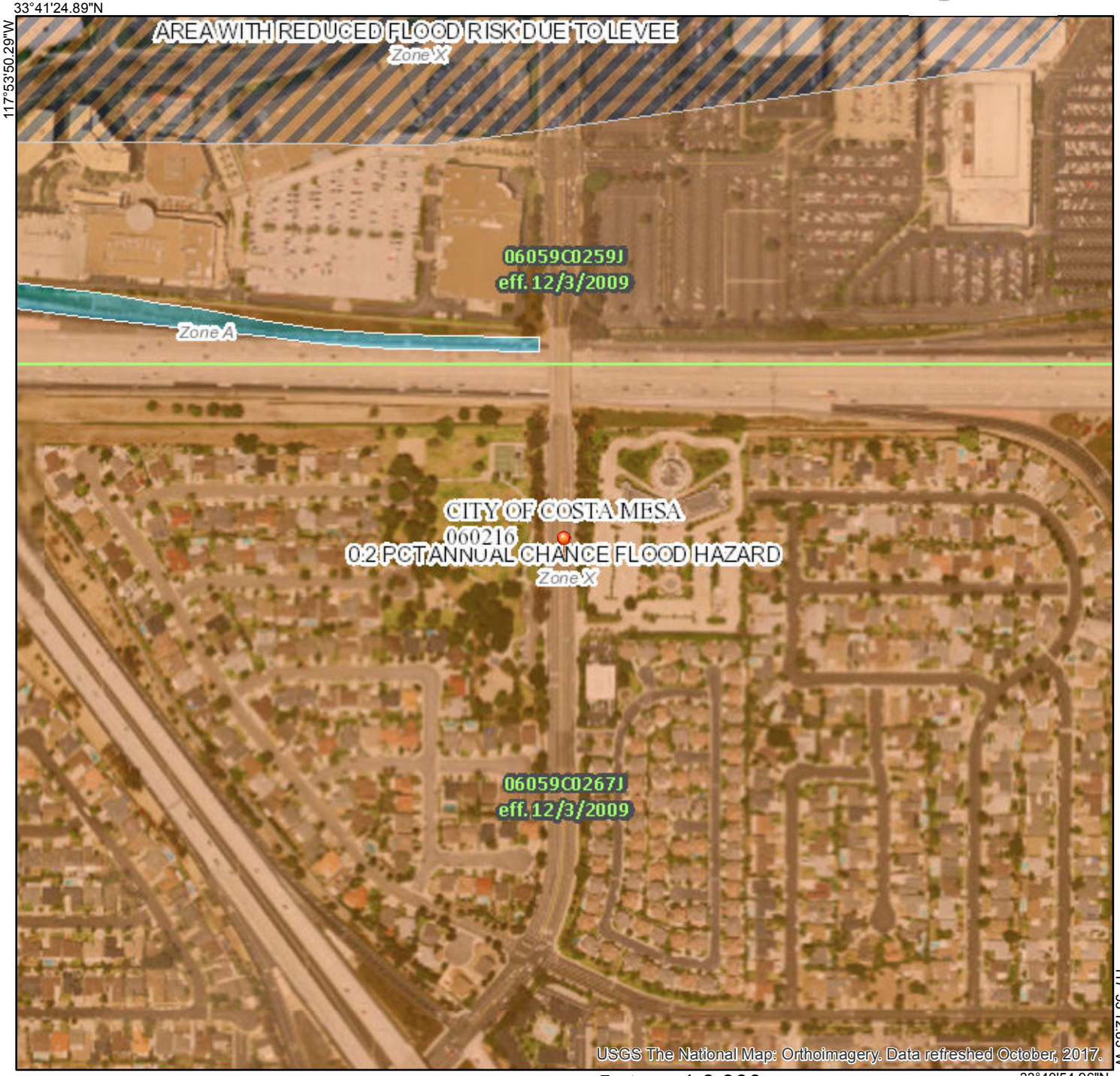
Hydraulic Calculations

National Flood Hazard Layer FIRMette

FEMA

33°41'24.89"N

117°53'50.29"W



117°53'12.83"W

33°40'54.96"N

Feet 1:6,000

0 250 500 1,000 1,500 2,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS

- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD

- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS

- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES

- B 20.2 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS

- Digital Data Available
- No Digital Data Available
- Unmapped

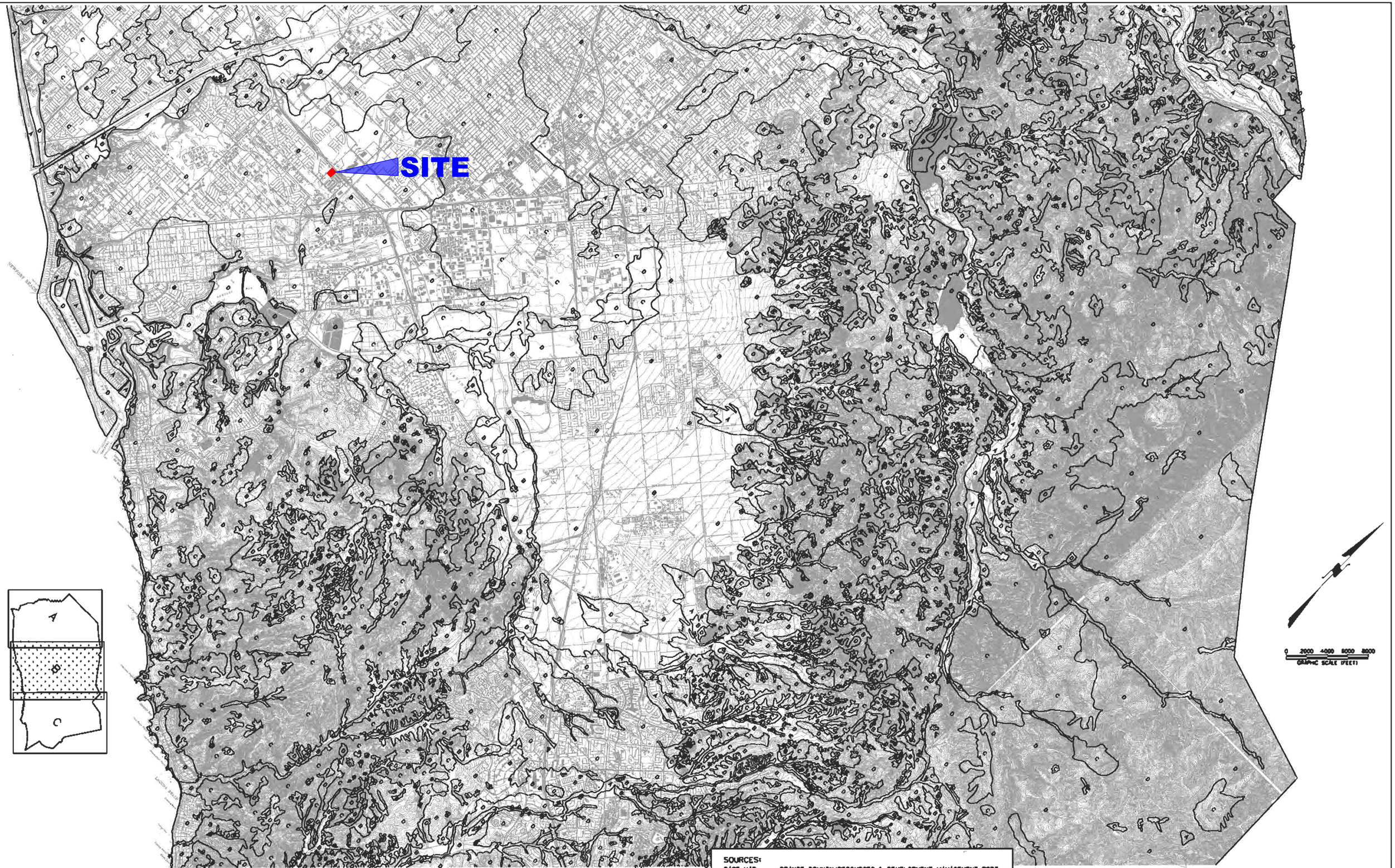
N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/5/2019 at 1:27:09 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



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

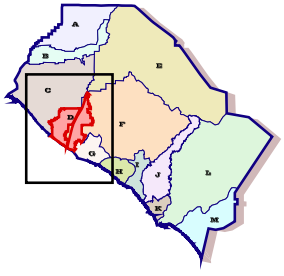
SOIL GROUPS - SOIL SURVEY OF ORANGE COUNTY AND WESTERN PART OF RIVERSIDE COUNTY, CALIFORNIA, USDA, SOIL CONSERVATION SERVICE, 1978.

ORANGE COUNTY
HYDROLOGY MANUAL

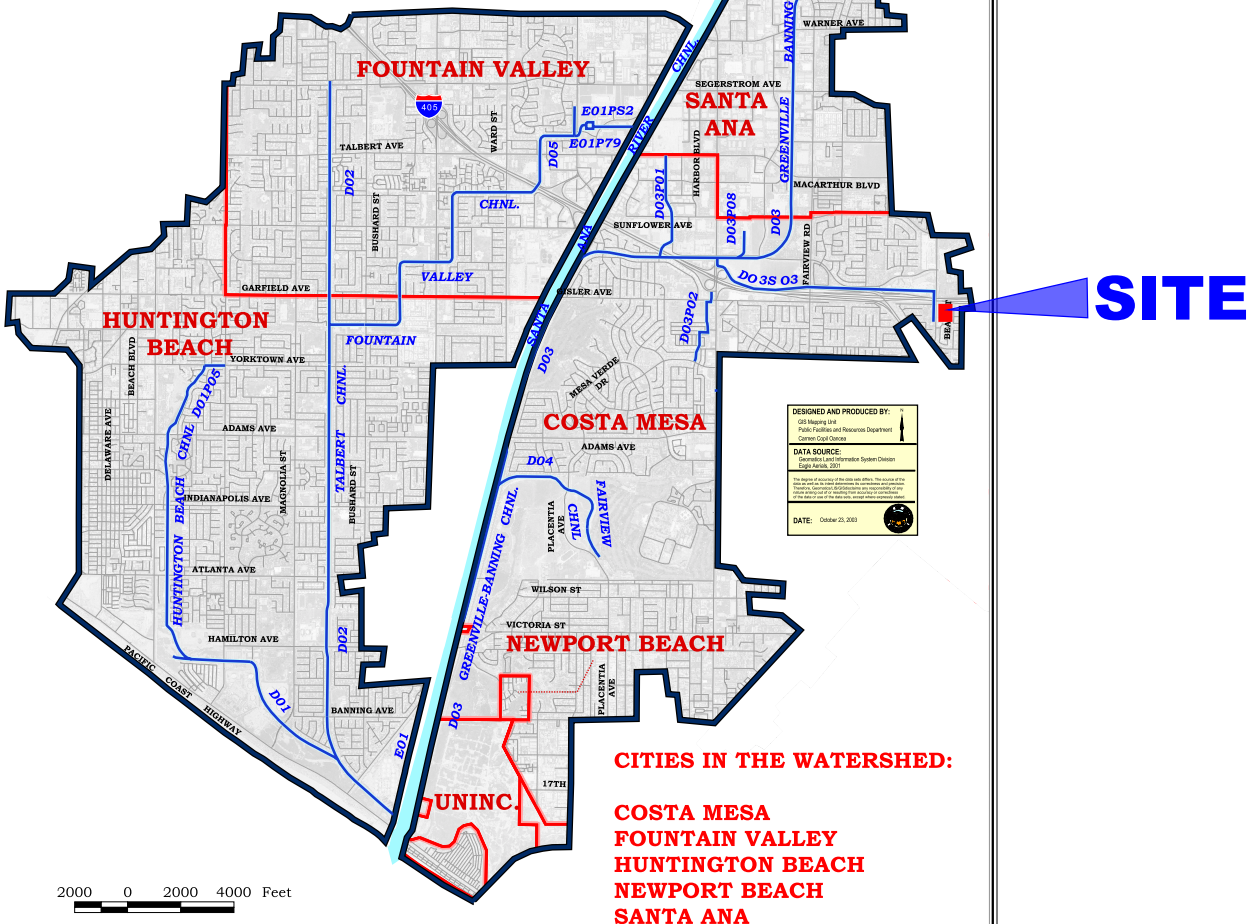
HYDROLOGIC CLASSIFICATION OF SOILS
ORANGE COUNTY, CALIFORNIA

PLATE B

WATERSHED D



D01 Huntington Beach Channel
D01B01 Bartlett Retarding Basin
D01P05 Huntington Beach Storm Drain
D01P06 Adams Storm Drain
D01PS1 Huntington Beach Pump Station
D01PS2 Huntington Beach Pump Station
D02 Talbert Channel
D03 Greenville-Banning Channel
D03P01 Hyland Storm Drain
D03P02 Mesa Verde Storm Drain
D03P08 Times Storm Drain
D03S03 Gisler Storm Channel
D04 Fairview Channel
D05 Fountain Valley Channel



CITIES IN THE WATERSHED:

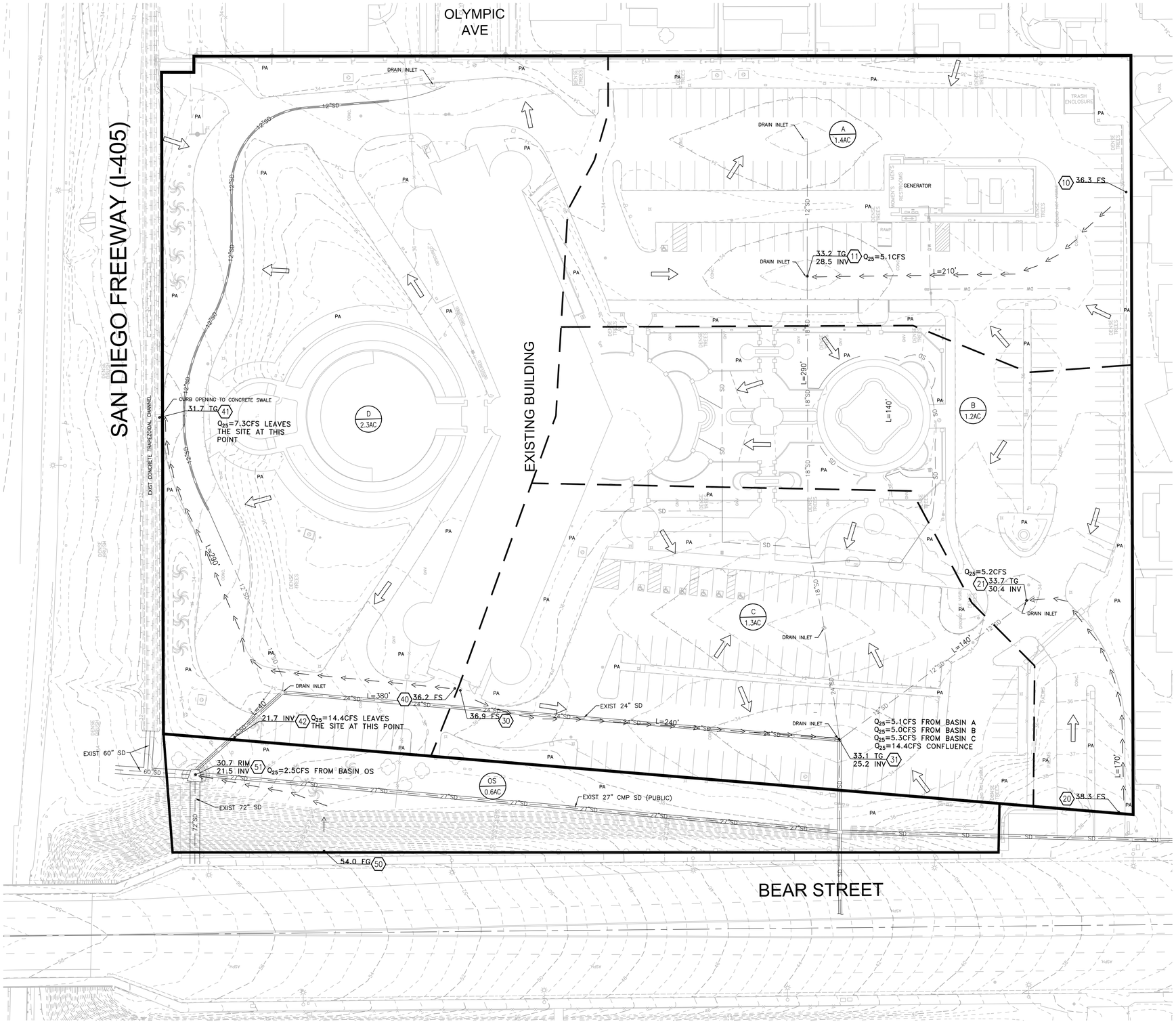
COSTA MESA
FOUNTAIN VALLEY
HUNTINGTON BEACH
NEWPORT BEACH
SANTA ANA
UNINCORPORATED

NOTICE

This drainage map has been prepared for information purposes only. The listed facilities have been determined from available information provided by public agencies, but may not be exact or up to date. The user of this map is responsible for verifying exact location, ownership and maintenance responsibilities of the drainage facilities. Additional information may be obtained from public plans and recorded deeds. Neither the County of Orange nor the Orange County Flood Control District (OCFCD) assumes any liabilities for inaccuracy of this map.

APPENDIX 3

Hydrology Maps



FLOOD PLAIN NOTE

THE PROJECT IS LOCATED IN FLOOD ZONE X PER FLOOD INSURANCE RATE MAP (FIRM) NUMBER 06059C0267J, REVISED DECEMBER 3, 2009 AS PUBLISHED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY IN ACCORDANCE WITH THE NATIONAL FLOOD INSURANCE PROGRAM. ZONE X HAS BEEN IDENTIFIED IN THE COMMUNITY FLOOD INSURANCE STUDY AS AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN.

HYDROLOGIC SITE DATA

SOIL TYPE:	D
A_i:	0.6
A_p:	0.4
F_m:	0.08 IN/HR
TOTAL AREA:	6.7 AC
SITE AREA:	6.1 AC

ABBREVIATIONS:

AC	ACRES
CFS	CUBIC FEET PER SECOND
ELEV	ELEVATION
FS	FINISH SURFACE
L	LENGTH
MIN	MINUTES
T_c	TIME OF CONCENTRATION

LEGEND:

- RIGHT-OF-WAY LINE
- CENTERLINE
- BASIN BOUNDARY
- SUBAREA BOUNDARY
- FLOW LINE
- 18"SD — STORM DRAIN LINE
- B/B2 — BASIN/SUBAREA DESIGNATION
- 11.3AC — AREA (ACRES)
- 10 — HYDROLOGY NODE
- Q_{25} — CALCULATED RUNOFF (CFS) FOR 25 YEAR FREQUENCY
- FLOW DIRECTION

30' 0' 15' 30'
SCALE: 1" = 30'

PREPARED BY:

FUSCOE ENGINEERING
16795 Von Karman, Suite 100
Irvine, California 92606
tel 949.474.1960 • fax 949.474.5315
www.fuscoe.com

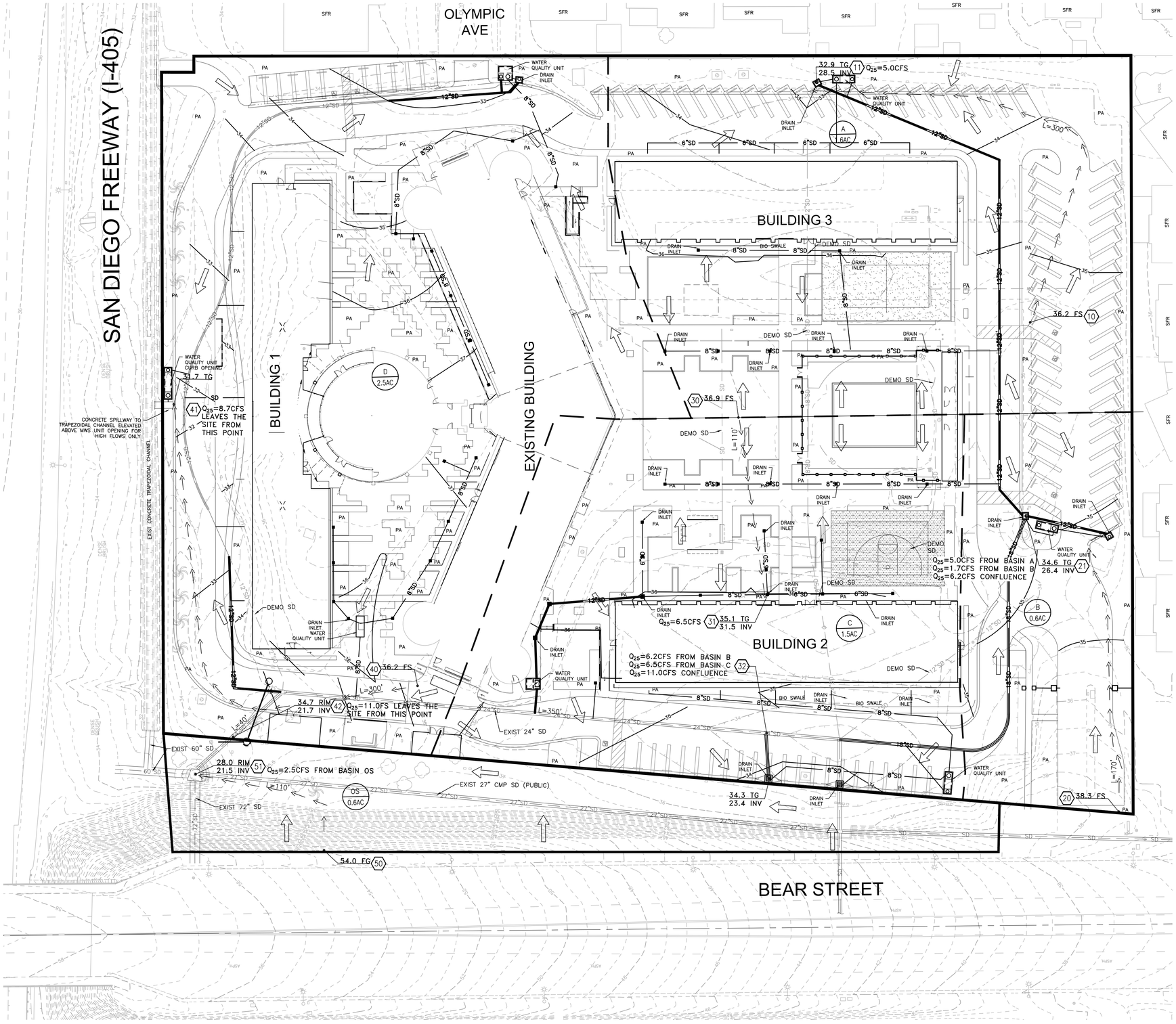
PRELIMINARY EXISTING HYDROLOGY MAP

EF INTERNATIONAL LANGUAGE CAMPUS COSTA MESA
COSTA MESA, CA

PREPARED ON: 08/21/2019

SHEET 1 OF 1

F:\PROJECTS\1793\001_SUPPORT FILES\REPORTS\HYDROLOGY\APPENDICES\1793-001HYD EXIST.DWG (08-21-19 1:50:45PM) Plotted by: Stuart Moore



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PRELIMINARY PROPOSED HYDROLOGY MAP

EF INTERNATIONAL LANGUAGE CAMPUS COSTA MESA
COSTA MESA, CA

PREPARED ON: 08/21/2019

F:\PROJECTS\1793\001_SUPPORT FILES\REPORTS\HYDROLOGY\APPENDICES\1793-001HYD PROP.DWG (08-21-19 1:51:39PM) Plotted by: Stuart Moore