Appendix F

Hydrology Analysis

HYDROLOGY ANALYSIS

FOR

TTM 17707

City of Lake Forest

PREPARED FOR:

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FEBRUARY 24, 2014

W.O. #2118-8

HYDROLOGY ANALYSIS

FOR

TTM 17707

City of Lake Forest

REGISTERED PROFESSIONAL ENGINEER
TU TRINH
No. 71555
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STATE OF CALIFORNIA

PREPARED UNDER THE SUPERVISION OF:

Tu Trinh, R.C.E. 71555 Exp. 12/31/15 2/25/14 Date

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SECTION 1

PROJECT NARRATIVE

PROJECT LOCATION

The project site is TTM 17707 in the City of Lake Forest. The site is bordered by an existing Commercial on the west, Portola Parkway on the east, Foothill Transportation Corridor on the north, and Sport park on the south (see attached Vicinity Map for details.)

STUDY PURPOSE

This report is to support the submittal of Tentative Tract Map.

METHODOLOGY

The methodology used to determine the peak discharges for TTM 17707 is based upon the criteria set forth in the *Orange County Flood Control District Hydrology Manual* dated 1986 as incorporated in the Advanced Engineering Software (AES) "RATSC" Program. The hydrologic soil types were determined from the Hydrologic Classification of Soils map contained in the *Orange County Hydrology Manual.*

DISCUSSION

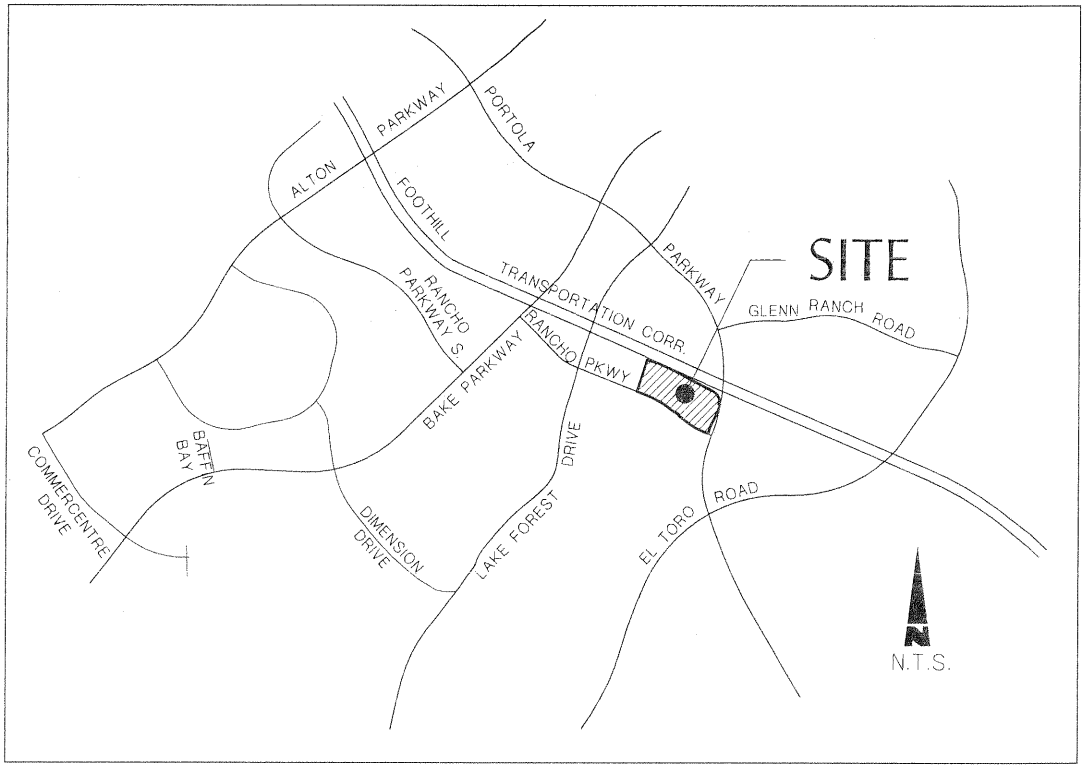
The site will be developed as residential with both single and multi-family dwelling units. The project is divided into two drainage areas "A' and "B" as shown on the hydrology map.

Storm drain system serving TTM17707 will be designed for the 25-yr storm event with secondary outlets provided at sump locations. At node #3, the exit elevation of the secondary outlet is 784.5ft while the lowest pad elevation is 786.5ft at lots 36 and 37. At node #29, the exit elevation of the secondary outlet is 774.5ft while the lowest pad elevation is 776.8ft at lot 90.

The 25-yr storm runoff produced from drainage area "A" is 71.3cfs and will be discharged into the modified existing Detention/Water Quality basin and then to a storm drain system designed for 73.5cfs prepared by Psomas (see reference section for the Drainage Report for Lake Forest Sport Park, dated January 29, 2010; also see Storm Drain Plan, sheets 18 and 23 of 46, dated December 20, 2011).

The 25-yr storm runoff produced from drainage area "B" is 7.6cfs and will be discharged into an existing 24" RCP designed for a Qmix of 15.9cfs prepared by RBF, dated August 2, 1990, sheet 32 of 38 (see reference section for plan).

VICINITY MAP



SECTION 2

HYDROLOGY CALCULATIONS

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****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
          (c) Copyright 1983-2013 Advanced Engineering Software (aes)
              Ver. 20.0  Release Date: 06/01/2013  License ID 1239

                          Analysis prepared by:

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

 ************************* DESCRIPTION OF STUDY *************************
* W.O. 2118-8, EL TORO MATERIALS                                         *
* 25-YR STUDY                                                            *
* PROPOSED CONDITION                                                     *
 ************************************************************************

  FILE NAME: ELTORO-P.DAT
  TIME/DATE OF STUDY: 12:53 02/18/2014
============================================================================
  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 = 0.90
  *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   18.0     13.0    0.017/0.017/0.020   0.50    1.50 0.0313 0.125 0.0150
  2   16.0     11.0    0.017/0.017/0.020   0.50    1.50 0.0313 0.125 0.0150

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

****************************************************************************
  FLOW PROCESS FROM NODE       1.00 TO NODE       2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   292.00
  ELEVATION DATA: UPSTREAM(FEET) =    792.80  DOWNSTREAM(FEET) =    789.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.991
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.460
  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        0.61      0.20      0.400    75    8.99
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  SUBAREA RUNOFF(CFS) =       1.86
  TOTAL AREA(ACRES) =       0.61   PEAK FLOW RATE(CFS) =       1.86

****************************************************************************
  FLOW PROCESS FROM NODE       2.00 TO NODE       3.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  789.70  DOWNSTREAM ELEVATION(FEET) =  784.60
  STREET LENGTH(FEET) =   422.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 18.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  13.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.017
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.017

  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) =       3.27
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.33
    HALFSTREET FLOOD WIDTH(FEET) =   11.86
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.49
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.83
  STREET FLOW TRAVEL TIME(MIN.) =   2.83   Tc(MIN.) =   11.82
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.964
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "8-10 DWELLINGS/ACRE"       D        1.09      0.20      0.400    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  SUBAREA AREA(ACRES) =    1.09      SUBAREA RUNOFF(CFS) =    2.83
  EFFECTIVE AREA(ACRES) =       1.70    AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.40
  TOTAL AREA(ACRES) =         1.7        PEAK FLOW RATE(CFS) =       4.41

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  13.48
```

```
  FLOW VELOCITY(FEET/SEC.) =  2.65   DEPTH*VELOCITY(FT*FT/SEC.) =   0.95
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     714.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.82
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.964
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "8-10 DWELLINGS/ACRE"       D        1.21      0.20      0.400    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  SUBAREA AREA(ACRES) =     1.21      SUBAREA RUNOFF(CFS) =     3.14
  EFFECTIVE AREA(ACRES) =       2.91   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.40
  TOTAL AREA(ACRES) =         2.9       PEAK FLOW RATE(CFS) =       7.55

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   292.00
  ELEVATION DATA: UPSTREAM(FEET) =    792.50  DOWNSTREAM(FEET) =    787.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.273
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.627
  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        0.62      0.20      0.400    75    8.27
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  SUBAREA RUNOFF(CFS) =       1.98
  TOTAL AREA(ACRES) =       0.62   PEAK FLOW RATE(CFS) =       1.98

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      9.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  787.80  DOWNSTREAM ELEVATION(FEET) =  780.00
  STREET LENGTH(FEET) =   518.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 18.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  13.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.017
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.017

  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) =       3.78
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.34
    HALFSTREET FLOOD WIDTH(FEET) =   12.06
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.78
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.93
  STREET FLOW TRAVEL TIME(MIN.) =   3.10   Tc(MIN.) =   11.38
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.029
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "8-10 DWELLINGS/ACRE"       D        1.35      0.20      0.400    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  SUBAREA AREA(ACRES) =     1.35      SUBAREA RUNOFF(CFS) =     3.58
  EFFECTIVE AREA(ACRES) =       1.97   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.40
  TOTAL AREA(ACRES) =         2.0       PEAK FLOW RATE(CFS) =       5.23

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.37   HALFSTREET FLOOD WIDTH(FEET) =  13.79
  FLOW VELOCITY(FEET/SEC.) =  3.01   DEPTH*VELOCITY(FT*FT/SEC.) =   1.10
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE      9.00 =     810.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE      9.00 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.) =   11.38
  RAINFALL INTENSITY(INCH/HR) =   3.03
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.40
  EFFECTIVE STREAM AREA(ACRES) =       1.97
  TOTAL STREAM AREA(ACRES) =       1.97
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.23

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      8.00 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) =    792.50  DOWNSTREAM(FEET) =    787.00
```

```
Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =     7.734
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.768
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        0.54      0.20      0.400    75    7.73
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
SUBAREA RUNOFF(CFS) =       1.79
TOTAL AREA(ACRES) =       0.54   PEAK FLOW RATE(CFS) =       1.79

****************************************************************************
FLOW PROCESS FROM NODE       8.00 TO NODE       9.00 IS CODE =  62
----------------------------------------------------------------------------
>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
UPSTREAM ELEVATION(FEET) =  787.00  DOWNSTREAM ELEVATION(FEET) =  780.00
STREET LENGTH(FEET) =   470.00   CURB HEIGHT(INCHES) =  6.0
STREET HALFWIDTH(FEET) = 18.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  13.00
INSIDE STREET CROSSFALL(DECIMAL) =  0.017
OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.017

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) =       3.39
  STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
  STREET FLOW DEPTH(FEET) =  0.33
  HALFSTREET FLOOD WIDTH(FEET) =   11.55
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.70
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.88
STREET FLOW TRAVEL TIME(MIN.) =   2.90   Tc(MIN.) =   10.64
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.146
SUBAREA LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
RESIDENTIAL
"8-10 DWELLINGS/ACRE"       D        1.15      0.20      0.400    75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
SUBAREA AREA(ACRES) =     1.15      SUBAREA RUNOFF(CFS) =     3.17
EFFECTIVE AREA(ACRES) =       1.69    AREA-AVERAGED Fm(INCH/HR) =  0.08
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.40
TOTAL AREA(ACRES) =         1.7        PEAK FLOW RATE(CFS) =       4.66

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.35   HALFSTREET FLOOD WIDTH(FEET) =  13.18
FLOW VELOCITY(FEET/SEC.) =  2.92   DEPTH*VELOCITY(FT*FT/SEC.) =   1.04
LONGEST FLOWPATH FROM NODE       7.00 TO NODE       9.00 =     745.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE       9.00 TO NODE       9.00 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.) =   10.64
RAINFALL INTENSITY(INCH/HR) =   3.15
AREA-AVERAGED Fm(INCH/HR) =  0.08
AREA-AVERAGED Fp(INCH/HR) =  0.20
AREA-AVERAGED Ap =  0.40
EFFECTIVE STREAM AREA(ACRES) =        1.69
TOTAL STREAM AREA(ACRES) =        1.69
PEAK FLOW RATE(CFS) AT CONFLUENCE =        4.66

** CONFLUENCE DATA **
 STREAM       Q       Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
 NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
    1        5.23   11.38    3.029  0.20( 0.08) 0.40       2.0       4.00
    2        4.66   10.64    3.146  0.20( 0.08) 0.40       1.7       7.00

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        9.75   10.64    3.146  0.20( 0.08) 0.40       3.5       7.00
    2        9.71   11.38    3.029  0.20( 0.08) 0.40       3.7       4.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =        9.75    Tc(MIN.) =     10.64
EFFECTIVE AREA(ACRES) =        3.53   AREA-AVERAGED Fm(INCH/HR) =  0.08
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.40
TOTAL AREA(ACRES) =         3.7
LONGEST FLOWPATH FROM NODE       4.00 TO NODE       9.00 =     810.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE       9.00 TO NODE      14.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   780.00  DOWNSTREAM(FEET) =   777.00
FLOW LENGTH(FEET) =   298.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  18.0 INCH PIPE IS  14.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   6.45
ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =        9.75
PIPE TRAVEL TIME(MIN.) =   0.77    Tc(MIN.) =   11.41
LONGEST FLOWPATH FROM NODE       4.00 TO NODE      14.00 =    1108.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     14.00 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.) =   11.41
  RAINFALL INTENSITY(INCH/HR) =   3.02
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.40
  EFFECTIVE STREAM AREA(ACRES) =        3.53
  TOTAL STREAM AREA(ACRES) =        3.66
  PEAK FLOW RATE(CFS) AT CONFLUENCE =        9.75

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   137.00
  ELEVATION DATA: UPSTREAM(FEET) =    781.50  DOWNSTREAM(FEET) =    779.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.961
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.367
  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        0.25      0.20      0.400    75    5.96
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  SUBAREA RUNOFF(CFS) =       0.96
  TOTAL AREA(ACRES) =       0.25   PEAK FLOW RATE(CFS) =       0.96

****************************************************************************
  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) =  779.00  DOWNSTREAM ELEVATION(FEET) =  777.00
  STREET LENGTH(FEET) =   246.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 18.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  13.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.017
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.017

  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) =        1.92
  STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
  STREET FLOW DEPTH(FEET) =  0.31
  HALFSTREET FLOOD WIDTH(FEET) =   10.33
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.86
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.57
STREET FLOW TRAVEL TIME(MIN.) =   2.20   Tc(MIN.) =    8.16
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.656
SUBAREA LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
RESIDENTIAL
"8-10 DWELLINGS/ACRE"       D        0.59      0.20      0.400    75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
SUBAREA AREA(ACRES) =    0.59      SUBAREA RUNOFF(CFS) =    1.90
EFFECTIVE AREA(ACRES) =      0.84    AREA-AVERAGED Fm(INCH/HR) =  0.08
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.40
TOTAL AREA(ACRES) =        0.8        PEAK FLOW RATE(CFS) =       2.70

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =  11.96
FLOW VELOCITY(FEET/SEC.) =  2.02   DEPTH*VELOCITY(FT*FT/SEC.) =   0.68
LONGEST FLOWPATH FROM NODE     12.00 TO NODE     14.00 =     383.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     14.00 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.) =    8.16
  RAINFALL INTENSITY(INCH/HR) =   3.66
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.40
  EFFECTIVE STREAM AREA(ACRES) =        0.84
  TOTAL STREAM AREA(ACRES) =        0.84
  PEAK FLOW RATE(CFS) AT CONFLUENCE =        2.70

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR)  (INCH/HR)          (ACRES)    NODE
      1        9.75   11.41    3.024  0.20( 0.08) 0.40       3.5       7.00
      1        9.71   12.15    2.919  0.20( 0.08) 0.40       3.7       4.00
      2        2.70    8.16    3.656  0.20( 0.08) 0.40       0.8      12.00

  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       11.17    8.16    3.656  0.20( 0.08) 0.40       3.4       12.00
    2       11.97   11.41    3.024  0.20( 0.08) 0.40       4.4        7.00
    3       11.86   12.15    2.919  0.20( 0.08) 0.40       4.5        4.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       11.97    Tc(MIN.) =    11.41
  EFFECTIVE AREA(ACRES) =        4.37   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.40
  TOTAL AREA(ACRES) =         4.5
  LONGEST FLOWPATH FROM NODE       4.00 TO NODE     14.00 =    1108.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     41.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   777.00  DOWNSTREAM(FEET) =   771.80
  FLOW LENGTH(FEET) =    53.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.50
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       11.97
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =   11.46
  LONGEST FLOWPATH FROM NODE       4.00 TO NODE     41.00 =    1161.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     41.00 TO NODE     41.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     16.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   185.00
  ELEVATION DATA: UPSTREAM(FEET) =    785.80  DOWNSTREAM(FEET) =    782.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.394
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.621
  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    5.39
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =       0.50
  TOTAL AREA(ACRES) =       0.12   PEAK FLOW RATE(CFS) =       0.50

****************************************************************************
  FLOW PROCESS FROM NODE     16.00 TO NODE     18.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  782.20  DOWNSTREAM ELEVATION(FEET) =  780.40
  STREET LENGTH(FEET) =   153.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 18.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  13.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.017
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.017

  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) =       1.17
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.26
    HALFSTREET FLOOD WIDTH(FEET) =    7.49
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.95
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.50
  STREET FLOW TRAVEL TIME(MIN.) =   1.31   Tc(MIN.) =    6.70
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.086
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "8-10 DWELLINGS/ACRE"       D        0.37      0.20     0.400    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  SUBAREA AREA(ACRES) =    0.37      SUBAREA RUNOFF(CFS) =    1.33
  EFFECTIVE AREA(ACRES) =      0.49    AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.33
  TOTAL AREA(ACRES) =        0.5        PEAK FLOW RATE(CFS) =       1.77

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   9.11
  FLOW VELOCITY(FEET/SEC.) =  2.14   DEPTH*VELOCITY(FT*FT/SEC.) =   0.61
  LONGEST FLOWPATH FROM NODE     15.00 TO NODE     18.00 =     338.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     18.00 TO NODE     18.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    6.70
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.086
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"        D        0.44      0.20     0.200    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
```

```
  SUBAREA AREA(ACRES) =     0.44      SUBAREA RUNOFF(CFS) =     1.60
  EFFECTIVE AREA(ACRES) =       0.93   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.27
  TOTAL AREA(ACRES) =         0.9        PEAK FLOW RATE(CFS) =        3.38

****************************************************************************
  FLOW PROCESS FROM NODE     18.00 TO NODE     22.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   780.40  DOWNSTREAM(FEET) =   777.90
  FLOW LENGTH(FEET) =   153.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.09
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        3.38
  PIPE TRAVEL TIME(MIN.) =   0.42    Tc(MIN.) =    7.12
  LONGEST FLOWPATH FROM NODE     15.00 TO NODE     22.00 =     491.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     22.00 TO NODE     22.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.12
  RAINFALL INTENSITY(INCH/HR) =   3.95
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.27
  EFFECTIVE STREAM AREA(ACRES) =       0.93
  TOTAL STREAM AREA(ACRES) =       0.93
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.38

****************************************************************************
  FLOW PROCESS FROM NODE     19.00 TO NODE     22.00 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) =    783.00  DOWNSTREAM(FEET) =    777.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.272
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.628
  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        0.47      0.20      0.400    75    8.27
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  SUBAREA RUNOFF(CFS) =       1.50
  TOTAL AREA(ACRES) =       0.47   PEAK FLOW RATE(CFS) =       1.50

****************************************************************************
  FLOW PROCESS FROM NODE     22.00 TO NODE     22.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.27
  RAINFALL INTENSITY(INCH/HR) =   3.63
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.40
  EFFECTIVE STREAM AREA(ACRES) =       0.47
  TOTAL STREAM AREA(ACRES) =       0.47
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.50

****************************************************************************
  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) =   259.00
  ELEVATION DATA: UPSTREAM(FEET) =    787.30  DOWNSTREAM(FEET) =    783.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.951
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.710
  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        0.56      0.20      0.400    75    7.95
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  SUBAREA RUNOFF(CFS) =       1.83
  TOTAL AREA(ACRES) =       0.56   PEAK FLOW RATE(CFS) =       1.83

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  783.30  DOWNSTREAM ELEVATION(FEET) =  777.90
  STREET LENGTH(FEET) =   340.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  11.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.017
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.017

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
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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) =       3.07
  STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
  STREET FLOW DEPTH(FEET) =  0.32
  HALFSTREET FLOOD WIDTH(FEET) =   10.89
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.72
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.86
STREET FLOW TRAVEL TIME(MIN.) =   2.08   Tc(MIN.) =   10.03
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.252
SUBAREA LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
RESIDENTIAL
"8-10 DWELLINGS/ACRE"       D        0.87      0.20      0.400    75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
SUBAREA AREA(ACRES) =     0.87      SUBAREA RUNOFF(CFS) =    2.48
EFFECTIVE AREA(ACRES) =       1.43    AREA-AVERAGED Fm(INCH/HR) =  0.08
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.40
TOTAL AREA(ACRES) =          1.4      PEAK FLOW RATE(CFS) =       4.08

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =  12.35
FLOW VELOCITY(FEET/SEC.) =  2.88   DEPTH*VELOCITY(FT*FT/SEC.) =   0.98
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =     599.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     22.00 TO NODE     22.00 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  3
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
TIME OF CONCENTRATION(MIN.) =   10.03
RAINFALL INTENSITY(INCH/HR) =   3.25
AREA-AVERAGED Fm(INCH/HR) =  0.08
AREA-AVERAGED Fp(INCH/HR) =  0.20
AREA-AVERAGED Ap =  0.40
EFFECTIVE STREAM AREA(ACRES) =       1.43
TOTAL STREAM AREA(ACRES) =       1.43
PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.08

** CONFLUENCE DATA **
 STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
    1        3.38    7.12    3.948  0.20( 0.05) 0.27       0.9      15.00
    2        1.50    8.27    3.628  0.20( 0.08) 0.40       0.5      19.00
    3        4.08   10.03    3.252  0.20( 0.08) 0.40       1.4      20.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR  3 STREAMS.
```

```
** PEAK FLOW RATE TABLE **
 STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
    1        8.32    7.12    3.948  0.20( 0.07) 0.35       2.3      15.00
    2        8.36    8.27    3.628  0.20( 0.07) 0.35       2.6      19.00
    3        8.20   10.03    3.252  0.20( 0.07) 0.36       2.8      20.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =       8.36    Tc(MIN.) =     8.27
EFFECTIVE AREA(ACRES) =       2.58   AREA-AVERAGED Fm(INCH/HR) =  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.35
TOTAL AREA(ACRES) =         2.8
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =     599.00 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) =   777.90  DOWNSTREAM(FEET) =   777.30
FLOW LENGTH(FEET) =    37.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   7.67
ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =       8.36
PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    8.35
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     25.00 =     636.00 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.) =    8.35
RAINFALL INTENSITY(INCH/HR) =   3.61
AREA-AVERAGED Fm(INCH/HR) =  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.20
AREA-AVERAGED Ap =  0.35
EFFECTIVE STREAM AREA(ACRES) =       2.58
TOTAL STREAM AREA(ACRES) =       2.83
PEAK FLOW RATE(CFS) AT CONFLUENCE =       8.36

****************************************************************************
FLOW PROCESS FROM NODE     23.00 TO NODE     24.00 IS CODE =  21
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
INITIAL SUBAREA FLOW-LENGTH(FEET) =   147.00
ELEVATION DATA: UPSTREAM(FEET) =    782.50  DOWNSTREAM(FEET) =    780.30

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.185
```

```
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.725
 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       0.11      0.20      0.100    75    5.19
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =       0.47
 TOTAL AREA(ACRES) =       0.11   PEAK FLOW RATE(CFS) =       0.47

****************************************************************************
 FLOW PROCESS FROM NODE      24.00 TO NODE      25.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  780.30  DOWNSTREAM ELEVATION(FEET) =  777.30
 STREET LENGTH(FEET) =   151.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 18.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  13.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.017
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.017

 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) =       1.16
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.24
   HALFSTREET FLOOD WIDTH(FEET) =    6.57
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.38
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.58
 STREET FLOW TRAVEL TIME(MIN.) =   1.06   Tc(MIN.) =    6.24
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.254
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "8-10 DWELLINGS/ACRE"       D        0.37      0.20      0.400    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
 SUBAREA AREA(ACRES) =    0.37      SUBAREA RUNOFF(CFS) =    1.39
 EFFECTIVE AREA(ACRES) =      0.48    AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.33
 TOTAL AREA(ACRES) =        0.5        PEAK FLOW RATE(CFS) =       1.81

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.27   HALFSTREET FLOOD WIDTH(FEET) =   8.20
 FLOW VELOCITY(FEET/SEC.) =  2.61   DEPTH*VELOCITY(FT*FT/SEC.) =   0.71
 LONGEST FLOWPATH FROM NODE     23.00 TO NODE     25.00 =     298.00 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.) =    6.24
 RAINFALL INTENSITY(INCH/HR) =   4.25
 AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.33
 EFFECTIVE STREAM AREA(ACRES) =       0.48
 TOTAL STREAM AREA(ACRES) =       0.48
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.81

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
     1        8.32    7.20    3.923  0.20( 0.07) 0.35       2.3      15.00
     1        8.36    8.35    3.608  0.20( 0.07) 0.35       2.6      19.00
     1        8.20   10.11    3.237  0.20( 0.07) 0.36       2.8      20.00
     2        1.81    6.24    4.254  0.20( 0.07) 0.33       0.5      23.00

 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        9.64    6.24    4.254  0.20( 0.07) 0.34       2.5      23.00
     2        9.98    7.20    3.923  0.20( 0.07) 0.34       2.8      15.00
     3        9.89    8.35    3.608  0.20( 0.07) 0.35       3.1      19.00
     4        9.57   10.11    3.237  0.20( 0.07) 0.35       3.3      20.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       9.98    Tc(MIN.) =     7.20
 EFFECTIVE AREA(ACRES) =       2.83   AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.34
 TOTAL AREA(ACRES) =        3.3
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     25.00 =     636.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      25.00 TO NODE      28.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   777.30  DOWNSTREAM(FEET) =   774.50
 FLOW LENGTH(FEET) =   180.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.82
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       9.98
 PIPE TRAVEL TIME(MIN.) =   0.38    Tc(MIN.) =    7.59
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     28.00 =     816.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     28.00 TO NODE     28.00 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.) =    7.59
  RAINFALL INTENSITY(INCH/HR) =   3.81
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.34
  EFFECTIVE STREAM AREA(ACRES) =        2.83
  TOTAL STREAM AREA(ACRES) =        3.31
  PEAK FLOW RATE(CFS) AT CONFLUENCE =        9.98

****************************************************************************
  FLOW PROCESS FROM NODE     26.00 TO NODE     27.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   147.00
  ELEVATION DATA: UPSTREAM(FEET) =    780.50  DOWNSTREAM(FEET) =    778.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.185
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.725
  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        0.11      0.20     0.100    75    5.19
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =       0.47
  TOTAL AREA(ACRES) =       0.11   PEAK FLOW RATE(CFS) =       0.47

****************************************************************************
  FLOW PROCESS FROM NODE     27.00 TO NODE     28.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  778.30  DOWNSTREAM ELEVATION(FEET) =  774.50
  STREET LENGTH(FEET) =   170.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 18.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  13.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.017
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.017

  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) =        1.14
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.24
    HALFSTREET FLOOD WIDTH(FEET) =    6.27
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.50
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.59
  STREET FLOW TRAVEL TIME(MIN.) =   1.13   Tc(MIN.) =    6.32
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.225
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "8-10 DWELLINGS/ACRE"      D        0.36      0.20     0.400    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  SUBAREA AREA(ACRES) =    0.36      SUBAREA RUNOFF(CFS) =    1.34
  EFFECTIVE AREA(ACRES) =      0.47    AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.33
  TOTAL AREA(ACRES) =        0.5        PEAK FLOW RATE(CFS) =       1.76

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.26   HALFSTREET FLOOD WIDTH(FEET) =   7.79
  FLOW VELOCITY(FEET/SEC.) =  2.76   DEPTH*VELOCITY(FT*FT/SEC.) =   0.73
  LONGEST FLOWPATH FROM NODE     26.00 TO NODE     28.00 =     317.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     28.00 TO NODE     28.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    6.32
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.225
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "8-10 DWELLINGS/ACRE"      D        0.47      0.20     0.400    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  SUBAREA AREA(ACRES) =    0.47      SUBAREA RUNOFF(CFS) =    1.75
  EFFECTIVE AREA(ACRES) =      0.94   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.36
  TOTAL AREA(ACRES) =        0.9        PEAK FLOW RATE(CFS) =       3.51

****************************************************************************
  FLOW PROCESS FROM NODE     28.00 TO NODE     28.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.32
  RAINFALL INTENSITY(INCH/HR) =   4.22
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.20
```

```
AREA-AVERAGED Ap =  0.36
EFFECTIVE STREAM AREA(ACRES) =        0.94
TOTAL STREAM AREA(ACRES) =        0.94
PEAK FLOW RATE(CFS) AT CONFLUENCE =        3.51

** CONFLUENCE DATA **
 STREAM        Q       Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
 NUMBER      (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
    1         9.64    6.63    4.112  0.20( 0.07) 0.34       2.5      23.00
    1         9.98    7.59    3.810  0.20( 0.07) 0.34       2.8      15.00
    1         9.89    8.74    3.517  0.20( 0.07) 0.35       3.1      19.00
    1         9.57   10.50    3.169  0.20( 0.07) 0.35       3.3      20.00
    2         3.51    6.32    4.225  0.20( 0.07) 0.36       0.9      26.00

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        12.96    6.32    4.225  0.20( 0.07) 0.35       3.3      26.00
    2        13.05    6.63    4.112  0.20( 0.07) 0.35       3.5      23.00
    3        13.15    7.59    3.810  0.20( 0.07) 0.35       3.8      15.00
    4        12.81    8.74    3.517  0.20( 0.07) 0.35       4.0      19.00
    5        12.19   10.50    3.169  0.20( 0.07) 0.36       4.2      20.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      13.15    Tc(MIN.) =      7.59
EFFECTIVE AREA(ACRES) =        3.77   AREA-AVERAGED Fm(INCH/HR) =  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.35
TOTAL AREA(ACRES) =        4.2
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     28.00 =     816.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     28.00 TO NODE     29.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   774.50  DOWNSTREAM(FEET) =   774.30
FLOW LENGTH(FEET) =    36.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  24.0 INCH PIPE IS  16.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   5.68
ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =      13.15
PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    7.69
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     29.00 =     852.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     29.00 TO NODE     29.00 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.) =    7.69
RAINFALL INTENSITY(INCH/HR) =   3.78
AREA-AVERAGED Fm(INCH/HR) =  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.20
AREA-AVERAGED Ap =  0.35
EFFECTIVE STREAM AREA(ACRES) =        3.77
TOTAL STREAM AREA(ACRES) =        4.25
PEAK FLOW RATE(CFS) AT CONFLUENCE =      13.15

****************************************************************************
FLOW PROCESS FROM NODE     28.10 TO NODE     28.20 IS CODE =  21
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
INITIAL SUBAREA FLOW-LENGTH(FEET) =   265.00
ELEVATION DATA: UPSTREAM(FEET) =    779.50  DOWNSTREAM(FEET) =    774.80

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.805
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.749
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        0.55      0.20      0.400    75    7.81
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
SUBAREA RUNOFF(CFS) =       1.82
TOTAL AREA(ACRES) =       0.55   PEAK FLOW RATE(CFS) =       1.82

****************************************************************************
FLOW PROCESS FROM NODE     28.20 TO NODE     29.00 IS CODE =  62
----------------------------------------------------------------------------
>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
UPSTREAM ELEVATION(FEET) =  774.80  DOWNSTREAM ELEVATION(FEET) =  774.30
STREET LENGTH(FEET) =    62.00   CURB HEIGHT(INCHES) =  6.0
STREET HALFWIDTH(FEET) = 18.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  13.00
INSIDE STREET CROSSFALL(DECIMAL) =  0.017
OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.017

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) =       2.45
  STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
  STREET FLOW DEPTH(FEET) =  0.33
  HALFSTREET FLOOD WIDTH(FEET) =   11.45
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.98
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.65
STREET FLOW TRAVEL TIME(MIN.) =   0.52   Tc(MIN.) =    8.33
```

```
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.614
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "8-10 DWELLINGS/ACRE"       D        0.40      0.20      0.400    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
 SUBAREA AREA(ACRES) =     0.40      SUBAREA RUNOFF(CFS) =     1.27
 EFFECTIVE AREA(ACRES) =       0.95    AREA-AVERAGED Fm(INCH/HR) =  0.08
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.40
 TOTAL AREA(ACRES) =         1.0        PEAK FLOW RATE(CFS) =       3.02

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =  12.57
 FLOW VELOCITY(FEET/SEC.) =  2.06   DEPTH*VELOCITY(FT*FT/SEC.) =   0.71
 LONGEST FLOWPATH FROM NODE     28.10 TO NODE     29.00 =     327.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     29.00 TO NODE     29.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    8.33
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.614
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "8-10 DWELLINGS/ACRE"       D        0.55      0.20      0.400    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
 SUBAREA AREA(ACRES) =     0.55      SUBAREA RUNOFF(CFS) =     1.75
 EFFECTIVE AREA(ACRES) =       1.50    AREA-AVERAGED Fm(INCH/HR) =  0.08
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.40
 TOTAL AREA(ACRES) =         1.5        PEAK FLOW RATE(CFS) =       4.77

****************************************************************************
 FLOW PROCESS FROM NODE     29.00 TO NODE     29.00 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.) =    8.33
 RAINFALL INTENSITY(INCH/HR) =   3.61
 AREA-AVERAGED Fm(INCH/HR) =  0.08
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.40
 EFFECTIVE STREAM AREA(ACRES) =       1.50
 TOTAL STREAM AREA(ACRES) =       1.50
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.77

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       12.96    6.43    4.185  0.20( 0.07) 0.35       3.3      26.00
     1       13.05    6.74    4.075  0.20( 0.07) 0.35       3.5      23.00
     1       13.15    7.69    3.780  0.20( 0.07) 0.35       3.8      15.00
     1       12.81    8.84    3.493  0.20( 0.07) 0.35       4.0      19.00
     1       12.19   10.61    3.151  0.20( 0.07) 0.36       4.2      20.00
     2        4.77    8.33    3.614  0.20( 0.08) 0.40       1.5      28.10

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

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       17.23    6.43    4.185  0.20( 0.07) 0.36       4.5      26.00
     2       17.42    6.74    4.075  0.20( 0.07) 0.36       4.7      23.00
     3       17.76    7.69    3.780  0.20( 0.07) 0.36       5.2      15.00
     4       17.73    8.33    3.614  0.20( 0.07) 0.36       5.4      28.10
     5       17.41    8.84    3.493  0.20( 0.07) 0.37       5.5      19.00
     6       16.33   10.61    3.151  0.20( 0.07) 0.37       5.8      20.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      17.76    Tc(MIN.) =     7.69
 EFFECTIVE AREA(ACRES) =       5.16   AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.36
 TOTAL AREA(ACRES) =         5.8
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     29.00 =     852.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     29.00 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) =   774.30  DOWNSTREAM(FEET) =   773.70
 FLOW LENGTH(FEET) =   123.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.81
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       17.76
 PIPE TRAVEL TIME(MIN.) =   0.35    Tc(MIN.) =    8.04
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     32.00 =     975.00 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.) =    8.04
 RAINFALL INTENSITY(INCH/HR) =   3.69
 AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.36
 EFFECTIVE STREAM AREA(ACRES) =       5.16
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TOTAL STREAM AREA(ACRES) =        5.75
PEAK FLOW RATE(CFS) AT CONFLUENCE =       17.76

****************************************************************************
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) =     778.00  DOWNSTREAM(FEET) =     774.50

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =     6.499
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.159
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       0.24      0.20      0.100    75    6.50
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
SUBAREA RUNOFF(CFS) =       0.89
TOTAL AREA(ACRES) =       0.24   PEAK FLOW RATE(CFS) =       0.89

****************************************************************************
FLOW PROCESS FROM NODE      31.00 TO NODE      31.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
MAINLINE Tc(MIN.) =     6.50
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.159
SUBAREA LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL                  D       0.19      0.20      0.100    75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
SUBAREA AREA(ACRES) =     0.19      SUBAREA RUNOFF(CFS) =     0.71
EFFECTIVE AREA(ACRES) =       0.43   AREA-AVERAGED Fm(INCH/HR) =  0.02
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
TOTAL AREA(ACRES) =        0.4       PEAK FLOW RATE(CFS) =       1.60

****************************************************************************
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) =    774.50  DOWNSTREAM(FEET) =    773.70
FLOW LENGTH(FEET) =     87.00   MANNING'S N =  0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   4.02
ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =        1.60
PIPE TRAVEL TIME(MIN.) =   0.36    Tc(MIN.) =     6.86
LONGEST FLOWPATH FROM NODE      30.00 TO NODE      32.00 =     337.00 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.) =     6.86
RAINFALL INTENSITY(INCH/HR) =   4.03
AREA-AVERAGED Fm(INCH/HR) =  0.02
AREA-AVERAGED Fp(INCH/HR) =  0.20
AREA-AVERAGED Ap =  0.10
EFFECTIVE STREAM AREA(ACRES) =        0.43
TOTAL STREAM AREA(ACRES) =        0.43
PEAK FLOW RATE(CFS) AT CONFLUENCE =        1.60

** CONFLUENCE DATA **
 STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
 NUMBER     (CFS)  (MIN.)  (INCH/HR)  (INCH/HR)          (ACRES)    NODE
    1       17.23    6.78    4.060  0.20( 0.07) 0.36       4.5      26.00
    1       17.42    7.09    3.959  0.20( 0.07) 0.36       4.7      23.00
    1       17.76    8.04    3.685  0.20( 0.07) 0.36       5.2      15.00
    1       17.73    8.68    3.530  0.20( 0.07) 0.36       5.4      28.10
    1       17.41    9.20    3.416  0.20( 0.07) 0.37       5.5      19.00
    1       16.33   10.97    3.093  0.20( 0.07) 0.37       5.8      20.00
    2        1.60    6.86    4.033  0.20( 0.02) 0.10       0.4      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       18.83    6.78    4.060  0.20( 0.07) 0.34       4.9      26.00
    2       18.88    6.86    4.033  0.20( 0.07) 0.34       5.0      30.00
    3       18.99    7.09    3.959  0.20( 0.07) 0.34       5.1      23.00
    4       19.22    8.04    3.685  0.20( 0.07) 0.34       5.6      15.00
    5       19.13    8.68    3.530  0.20( 0.07) 0.35       5.8      28.10
    6       18.77    9.20    3.416  0.20( 0.07) 0.35       5.9      19.00
    7       17.56   10.97    3.093  0.20( 0.07) 0.35       6.2      20.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =       19.22    Tc(MIN.) =      8.04
EFFECTIVE AREA(ACRES) =        5.59   AREA-AVERAGED Fm(INCH/HR) =  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.34
TOTAL AREA(ACRES) =         6.2
LONGEST FLOWPATH FROM NODE      20.00 TO NODE      32.00 =     975.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      32.00 TO NODE      38.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   773.70  DOWNSTREAM(FEET) =   772.30
  FLOW LENGTH(FEET) =   277.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  20.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.96
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      19.22
  PIPE TRAVEL TIME(MIN.) =   0.77    Tc(MIN.) =    8.82
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     38.00 =    1252.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     38.00 TO NODE     38.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
==============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     33.00 TO NODE     34.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   266.00
  ELEVATION DATA: UPSTREAM(FEET) =    788.00  DOWNSTREAM(FEET) =    784.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.207
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.644
  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        0.53      0.20      0.400    75    8.21
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  SUBAREA RUNOFF(CFS) =       1.70
  TOTAL AREA(ACRES) =       0.53   PEAK FLOW RATE(CFS) =       1.70

****************************************************************************
  FLOW PROCESS FROM NODE     34.00 TO NODE     37.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
==============================================================================
  UPSTREAM ELEVATION(FEET) =  784.30  DOWNSTREAM ELEVATION(FEET) =  777.60
  STREET LENGTH(FEET) =   623.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  11.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.017
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.017

  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) =       3.11
  STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
  STREET FLOW DEPTH(FEET) =  0.33
  HALFSTREET FLOOD WIDTH(FEET) =   11.92
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.34
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.78
  STREET FLOW TRAVEL TIME(MIN.) =   4.44   Tc(MIN.) =   12.65
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.853
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "8-10 DWELLINGS/ACRE"       D        1.12      0.20      0.400    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  SUBAREA AREA(ACRES) =    1.12      SUBAREA RUNOFF(CFS) =    2.79
  EFFECTIVE AREA(ACRES) =      1.65    AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.40
  TOTAL AREA(ACRES) =        1.6        PEAK FLOW RATE(CFS) =       4.12

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  13.38
  FLOW VELOCITY(FEET/SEC.) =  2.51   DEPTH*VELOCITY(FT*FT/SEC.) =   0.90
  LONGEST FLOWPATH FROM NODE     33.00 TO NODE     37.00 =     889.00 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.) =   12.65
  RAINFALL INTENSITY(INCH/HR) =   2.85
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.40
  EFFECTIVE STREAM AREA(ACRES) =       1.65
  TOTAL STREAM AREA(ACRES) =       1.65
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.12

****************************************************************************
  FLOW PROCESS FROM NODE     36.00 TO NODE     37.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  ELEVATION DATA: UPSTREAM(FEET) =    778.70  DOWNSTREAM(FEET) =    777.60

  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       0.18       0.20      0.100   75    5.00
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
SUBAREA RUNOFF(CFS) =       0.78
TOTAL AREA(ACRES) =       0.18   PEAK FLOW RATE(CFS) =       0.78

****************************************************************************
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.) =    5.00
RAINFALL INTENSITY(INCH/HR) =   4.82
AREA-AVERAGED Fm(INCH/HR) =  0.02
AREA-AVERAGED Fp(INCH/HR) =  0.20
AREA-AVERAGED Ap =  0.10
EFFECTIVE STREAM AREA(ACRES) =       0.18
TOTAL STREAM AREA(ACRES) =       0.18
PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.78

** CONFLUENCE DATA **
 STREAM       Q      Tc   Intensity   Fp(Fm)      Ap     Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
    1        4.12   12.65    2.853  0.20( 0.08) 0.40       1.6      33.00
    2        0.78    5.00    4.824  0.20( 0.02) 0.10       0.2      36.00

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        3.56    5.00    4.824  0.20( 0.07) 0.34       0.8      36.00
    2        4.58   12.65    2.853  0.20( 0.07) 0.37       1.8      33.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =       4.58    Tc(MIN.) =    12.65
EFFECTIVE AREA(ACRES) =       1.83   AREA-AVERAGED Fm(INCH/HR) =  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.37
TOTAL AREA(ACRES) =        1.8
LONGEST FLOWPATH FROM NODE     33.00 TO NODE     37.00 =     889.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     37.00 TO NODE     38.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   777.60  DOWNSTREAM(FEET) =   772.30
FLOW LENGTH(FEET) =    49.00   MANNING'S N =  0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =  13.07
ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =       4.58
PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =   12.71
LONGEST FLOWPATH FROM NODE     33.00 TO NODE     38.00 =     938.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     38.00 TO NODE     38.00 IS CODE =  11
----------------------------------------------------------------------------
>>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

** MAIN STREAM CONFLUENCE DATA **
 STREAM       Q      Tc   Intensity   Fp(Fm)      Ap     Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
    1        3.56    5.07    4.787  0.20( 0.07) 0.34       0.8      36.00
    2        4.58   12.71    2.845  0.20( 0.07) 0.37       1.8      33.00
LONGEST FLOWPATH FROM NODE     33.00 TO NODE     38.00 =     938.00 FEET.

** MEMORY BANK #  2 CONFLUENCE DATA **
 STREAM       Q      Tc   Intensity   Fp(Fm)      Ap     Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
    1       18.83    7.56    3.818  0.20( 0.07) 0.34       4.9      26.00
    2       18.88    7.64    3.796  0.20( 0.07) 0.34       5.0      30.00
    3       18.99    7.87    3.733  0.20( 0.07) 0.34       5.1      23.00
    4       19.22    8.82    3.499  0.20( 0.07) 0.34       5.6      15.00
    5       19.13    9.45    3.364  0.20( 0.07) 0.35       5.8      28.10
    6       18.77    9.97    3.263  0.20( 0.07) 0.35       5.9      19.00
    7       17.56   11.75    2.974  0.20( 0.07) 0.35       6.2      20.00
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     38.00 =    1252.00 FEET.

** PEAK FLOW RATE TABLE **
 STREAM       Q      Tc   Intensity   Fp(Fm)      Ap     Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
    1       19.45    5.07    4.787  0.20( 0.07) 0.34       4.1      36.00
    2       22.72    7.56    3.818  0.20( 0.07) 0.34       6.1      26.00
    3       22.79    7.64    3.796  0.20( 0.07) 0.34       6.1      30.00
    4       22.92    7.87    3.733  0.20( 0.07) 0.34       6.3      23.00
    5       23.28    8.82    3.499  0.20( 0.07) 0.34       6.9      15.00
    6       23.27    9.45    3.364  0.20( 0.07) 0.35       7.2      28.10
    7       22.98    9.97    3.263  0.20( 0.07) 0.35       7.4      19.00
    8       22.01   11.75    2.974  0.20( 0.07) 0.35       7.9      20.00
    9       21.35   12.71    2.845  0.20( 0.07) 0.35       8.0      33.00
  TOTAL AREA(ACRES) =        8.0

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      23.28  Tc(MIN.) =    8.819
EFFECTIVE AREA(ACRES) =       6.91  AREA-AVERAGED Fm(INCH/HR) =  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.35
TOTAL AREA(ACRES) =        8.0
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     38.00 =    1252.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     38.00 TO NODE     38.00 IS CODE =  12
----------------------------------------------------------------------------
>>>>>CLEAR MEMORY BANK # 2 <<<<<
```

```
==============================================================================

******************************************************************************
  FLOW PROCESS FROM NODE     38.00 TO NODE     40.00 IS CODE =  31
------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   772.30  DOWNSTREAM(FEET) =   772.00
  FLOW LENGTH(FEET) =    65.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  21.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.08
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      23.28
  PIPE TRAVEL TIME(MIN.) =   0.18    Tc(MIN.) =    9.00
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     40.00 =    1317.00 FEET.

******************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =   1
------------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.00
  RAINFALL INTENSITY(INCH/HR) =   3.46
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.34
  EFFECTIVE STREAM AREA(ACRES) =       6.91
  TOTAL STREAM AREA(ACRES) =       8.01
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      23.28

******************************************************************************
  FLOW PROCESS FROM NODE     39.00 TO NODE     40.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   200.00
  ELEVATION DATA: UPSTREAM(FEET) =    778.00  DOWNSTREAM(FEET) =    776.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.357
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.211
  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       0.18      0.20      0.100    75    6.36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =       0.68
  TOTAL AREA(ACRES) =       0.18   PEAK FLOW RATE(CFS) =       0.68

******************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =   1
------------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.36
  RAINFALL INTENSITY(INCH/HR) =   4.21
  AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.18
  TOTAL STREAM AREA(ACRES) =       0.18
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.68

******************************************************************************
  FLOW PROCESS FROM NODE     39.10 TO NODE     39.20 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   283.00
  ELEVATION DATA: UPSTREAM(FEET) =    781.00  DOWNSTREAM(FEET) =    777.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.549
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.820
  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
  "11+ DWELLINGS/ACRE"        D       0.31      0.20      0.200    75    7.55
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =       1.05
  TOTAL AREA(ACRES) =       0.31   PEAK FLOW RATE(CFS) =       1.05

******************************************************************************
  FLOW PROCESS FROM NODE     39.20 TO NODE     40.00 IS CODE =  62
------------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
==============================================================================
  UPSTREAM ELEVATION(FEET) =  777.70  DOWNSTREAM ELEVATION(FEET) =  776.00
  STREET LENGTH(FEET) =   125.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 18.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  13.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.017
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.017

  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) =       2.04
```

```
  STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
  STREET FLOW DEPTH(FEET) =  0.29
  HALFSTREET FLOOD WIDTH(FEET) =    9.42
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.33
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.68
STREET FLOW TRAVEL TIME(MIN.) =   0.89   Tc(MIN.) =    8.44
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.586
SUBAREA LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
RESIDENTIAL
"5-7 DWELLINGS/ACRE"        D        0.63      0.20      0.500    75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
SUBAREA AREA(ACRES) =     0.63      SUBAREA RUNOFF(CFS) =     1.98
EFFECTIVE AREA(ACRES) =       0.94    AREA-AVERAGED Fm(INCH/HR) =  0.08
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.40
TOTAL AREA(ACRES) =         0.9        PEAK FLOW RATE(CFS) =       2.97

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =  11.14
FLOW VELOCITY(FEET/SEC.) =  2.52   DEPTH*VELOCITY(FT*FT/SEC.) =   0.81
LONGEST FLOWPATH FROM NODE     39.10 TO NODE     40.00 =     408.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  3
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
TIME OF CONCENTRATION(MIN.) =    8.44
RAINFALL INTENSITY(INCH/HR) =   3.59
AREA-AVERAGED Fm(INCH/HR) =  0.08
AREA-AVERAGED Fp(INCH/HR) =  0.20
AREA-AVERAGED Ap =  0.40
EFFECTIVE STREAM AREA(ACRES) =       0.94
TOTAL STREAM AREA(ACRES) =       0.94
PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.97

** CONFLUENCE DATA **
 STREAM       Q       Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
 NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)            (ACRES)    NODE
    1       19.45    5.26    4.689  0.20( 0.07) 0.34       4.1      36.00
    1       22.72    7.74    3.768  0.20( 0.07) 0.34       6.1      26.00
    1       22.79    7.81    3.746  0.20( 0.07) 0.34       6.1      30.00
    1       22.92    8.04    3.686  0.20( 0.07) 0.34       6.3      23.00
    1       23.28    9.00    3.459  0.20( 0.07) 0.34       6.9      15.00
    1       23.27    9.63    3.328  0.20( 0.07) 0.35       7.2      28.10
    1       22.98   10.15    3.231  0.20( 0.07) 0.35       7.4      19.00
    1       22.01   11.93    2.949  0.20( 0.07) 0.35       7.9      20.00
    1       21.35   12.89    2.822  0.20( 0.07) 0.35       8.0      33.00
    2        0.68    6.36    4.211  0.20( 0.02) 0.10       0.2      39.00
    3        2.97    8.44    3.586  0.20( 0.08) 0.40       0.9      39.10

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR  3 STREAMS.

** PEAK FLOW RATE TABLE **
 STREAM       Q       Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
 NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)            (ACRES)    NODE
    1       22.50    5.26    4.689  0.20( 0.07) 0.34       4.9      36.00
    2       24.21    6.36    4.211  0.20( 0.07) 0.34       5.9      39.00
    3       26.19    7.74    3.768  0.20( 0.07) 0.34       7.1      26.00
    4       26.26    7.81    3.746  0.20( 0.07) 0.34       7.2      30.00
    5       26.42    8.04    3.686  0.20( 0.07) 0.34       7.4      23.00
    6       26.62    8.44    3.586  0.20( 0.07) 0.34       7.7      39.10
    7       26.70    9.00    3.459  0.20( 0.07) 0.35       8.0      15.00
    8       26.56    9.63    3.328  0.20( 0.07) 0.35       8.4      28.10
    9       26.17   10.15    3.231  0.20( 0.07) 0.35       8.5      19.00
   10       24.91   11.93    2.949  0.20( 0.07) 0.35       9.0      20.00
   11       24.13   12.89    2.822  0.20( 0.07) 0.35       9.1      33.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =       26.70    Tc(MIN.) =      9.00
EFFECTIVE AREA(ACRES) =       8.03   AREA-AVERAGED Fm(INCH/HR) =  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.35
TOTAL AREA(ACRES) =         9.1
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     40.00 =    1317.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     40.00 TO NODE     41.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   772.00  DOWNSTREAM(FEET) =   771.80
FLOW LENGTH(FEET) =    38.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  30.0 INCH PIPE IS  23.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   6.54
ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =       26.70
PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    9.09
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     41.00 =    1355.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     41.00 TO NODE     41.00 IS CODE =  11
----------------------------------------------------------------------------
>>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

** MAIN STREAM CONFLUENCE DATA **
 STREAM       Q       Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
 NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)            (ACRES)    NODE
    1       22.50    5.36    4.640  0.20( 0.07) 0.34       4.9      36.00
    2       24.21    6.46    4.174  0.20( 0.07) 0.34       5.9      39.00
    3       26.19    7.83    3.742  0.20( 0.07) 0.34       7.1      26.00
    4       26.26    7.91    3.720  0.20( 0.07) 0.34       7.2      30.00
    5       26.42    8.14    3.661  0.20( 0.07) 0.34       7.4      23.00
    6       26.62    8.54    3.563  0.20( 0.07) 0.34       7.7      39.10
    7       26.70    9.09    3.438  0.20( 0.07) 0.35       8.0      15.00
```

```
    8       26.56    9.73    3.309  0.20( 0.07) 0.35       8.4      28.10
    9       26.17   10.25    3.213  0.20( 0.07) 0.35       8.5      19.00
   10       24.91   12.03    2.935  0.20( 0.07) 0.35       9.0      20.00
   11       24.13   12.99    2.810  0.20( 0.07) 0.35       9.1      33.00
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     41.00 =    1355.00 FEET.

** MEMORY BANK #  1 CONFLUENCE DATA **
 STREAM        Q       Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
 NUMBER      (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
    1        11.17    8.22    3.642  0.20( 0.08) 0.40       3.4      12.00
    2        11.97   11.46    3.016  0.20( 0.08) 0.40       4.4       7.00
    3        11.86   12.20    2.911  0.20( 0.08) 0.40       4.5       4.00
LONGEST FLOWPATH FROM NODE      4.00 TO NODE     41.00 =    1161.00 FEET.

** PEAK FLOW RATE TABLE **
 STREAM        Q       Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
 NUMBER      (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
    1        31.83    5.36    4.640  0.20( 0.07) 0.36       7.1      36.00
    2        34.30    6.46    4.174  0.20( 0.07) 0.36       8.5      39.00
    3        37.13    7.83    3.742  0.20( 0.07) 0.36      10.3      26.00
    4        37.25    7.91    3.720  0.20( 0.07) 0.36      10.4      30.00
    5        37.55    8.14    3.661  0.20( 0.07) 0.36      10.7      23.00
    6        37.63    8.22    3.642  0.20( 0.07) 0.36      10.8      12.00
    7        37.87    8.54    3.563  0.20( 0.07) 0.36      11.1      39.10
    8        38.09    9.09    3.438  0.20( 0.07) 0.36      11.7      15.00
    9        38.10    9.73    3.309  0.20( 0.07) 0.36      12.2      28.10
   10        37.84   10.25    3.213  0.20( 0.07) 0.37      12.5      19.00
   11        37.28   11.46    3.016  0.20( 0.07) 0.37      13.2       7.00
   12        36.79   12.03    2.935  0.20( 0.07) 0.37      13.5      20.00
   13        36.63   12.20    2.911  0.20( 0.07) 0.37      13.5       4.00
   14        35.56   12.99    2.810  0.20( 0.07) 0.37      13.6      33.00
  TOTAL AREA(ACRES) =        13.6

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =       38.10  Tc(MIN.) =     9.729
EFFECTIVE AREA(ACRES) =     12.19  AREA-AVERAGED Fm(INCH/HR) =  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.36
TOTAL AREA(ACRES) =       13.6
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     41.00 =    1355.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     41.00 TO NODE     41.00 IS CODE =  12
----------------------------------------------------------------------------
>>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
FLOW PROCESS FROM NODE     41.00 TO NODE     46.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   771.80  DOWNSTREAM(FEET) =   768.80
FLOW LENGTH(FEET) =   328.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  33.0 INCH PIPE IS  22.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   8.96
ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =       38.10
PIPE TRAVEL TIME(MIN.) =   0.61    Tc(MIN.) =   10.34
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     46.00 =    1683.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     46.00 TO NODE     46.00 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.) =   10.34
RAINFALL INTENSITY(INCH/HR) =   3.20
AREA-AVERAGED Fm(INCH/HR) =  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.20
AREA-AVERAGED Ap =  0.36
EFFECTIVE STREAM AREA(ACRES) =      12.19
TOTAL STREAM AREA(ACRES) =      13.63
PEAK FLOW RATE(CFS) AT CONFLUENCE =      38.10

****************************************************************************
FLOW PROCESS FROM NODE     43.00 TO NODE     44.00 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) =    776.80  DOWNSTREAM(FEET) =    774.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.752
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.764
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
"11+ DWELLINGS/ACRE"        D        0.85      0.20     0.200    75    7.75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
SUBAREA RUNOFF(CFS) =       2.85
TOTAL AREA(ACRES) =       0.85   PEAK FLOW RATE(CFS) =      2.85

****************************************************************************
FLOW PROCESS FROM NODE     44.00 TO NODE     45.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   774.00  DOWNSTREAM(FEET) =   770.00
FLOW LENGTH(FEET) =   400.00   MANNING'S N =  0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   4.87
ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =       2.85
```

```
PIPE TRAVEL TIME(MIN.) =   1.37    Tc(MIN.) =    9.12
LONGEST FLOWPATH FROM NODE     43.00 TO NODE     45.00 =     680.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     45.00 TO NODE     45.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
MAINLINE Tc(MIN.) =    9.12
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.432
SUBAREA LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
RESIDENTIAL
"11+ DWELLINGS/ACRE"        D        8.22      0.20      0.200    75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
SUBAREA AREA(ACRES) =     8.22      SUBAREA RUNOFF(CFS) =    25.10
EFFECTIVE AREA(ACRES) =       9.07   AREA-AVERAGED Fm(INCH/HR) =  0.04
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
TOTAL AREA(ACRES) =         9.1       PEAK FLOW RATE(CFS) =      27.69

****************************************************************************
FLOW PROCESS FROM NODE     45.00 TO NODE     46.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   770.00  DOWNSTREAM(FEET) =   768.80
FLOW LENGTH(FEET) =   232.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  30.0 INCH PIPE IS  24.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   6.50
ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =      27.69
PIPE TRAVEL TIME(MIN.) =   0.59    Tc(MIN.) =    9.72
LONGEST FLOWPATH FROM NODE     43.00 TO NODE     46.00 =     912.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     46.00 TO NODE     46.00 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.) =    9.72
RAINFALL INTENSITY(INCH/HR) =   3.31
AREA-AVERAGED Fm(INCH/HR) =  0.04
AREA-AVERAGED Fp(INCH/HR) =  0.20
AREA-AVERAGED Ap =  0.20
EFFECTIVE STREAM AREA(ACRES) =       9.07
TOTAL STREAM AREA(ACRES) =       9.07
PEAK FLOW RATE(CFS) AT CONFLUENCE =      27.69

** CONFLUENCE DATA **
 STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
```

NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)		(ACRES)	NODE
1	31.83	6.00	4.352	0.20(0.07)	0.36	7.1	36.00
1	34.30	7.09	3.958	0.20(0.07)	0.36	8.5	39.00
1	37.13	8.47	3.581	0.20(0.07)	0.36	10.3	26.00
1	37.25	8.52	3.567	0.20(0.07)	0.36	10.4	30.00
1	37.55	8.75	3.514	0.20(0.07)	0.36	10.7	23.00
1	37.63	8.83	3.497	0.20(0.07)	0.36	10.8	12.00
1	37.87	9.15	3.427	0.20(0.07)	0.36	11.1	39.10
1	38.09	9.70	3.314	0.20(0.07)	0.36	11.7	15.00
1	38.10	10.34	3.197	0.20(0.07)	0.36	12.2	28.10
1	37.84	10.86	3.110	0.20(0.07)	0.37	12.5	19.00
1	37.28	12.07	2.929	0.20(0.07)	0.37	13.2	7.00
1	36.79	12.66	2.851	0.20(0.07)	0.37	13.5	20.00
1	36.63	12.83	2.829	0.20(0.07)	0.37	13.5	4.00
1	35.56	13.62	2.735	0.20(0.07)	0.37	13.6	33.00
2	27.69	9.72	3.312	0.20(0.04)	0.20	9.1	43.00

```
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	54.35	6.00	4.352	0.20(0.06)	0.29	12.7	36.00
2	58.50	7.09	3.958	0.20(0.06)	0.29	15.1	39.00
3	63.24	8.47	3.581	0.20(0.06)	0.29	18.2	26.00
4	63.44	8.52	3.567	0.20(0.06)	0.29	18.4	30.00
5	64.03	8.75	3.514	0.20(0.06)	0.29	18.9	23.00
6	64.21	8.83	3.497	0.20(0.06)	0.29	19.0	12.00
7	64.86	9.15	3.427	0.20(0.06)	0.29	19.7	39.10
8	65.76	9.70	3.314	0.20(0.06)	0.29	20.7	15.00
9	65.78	9.72	3.312	0.20(0.06)	0.29	20.7	43.00
10	64.83	10.34	3.197	0.20(0.06)	0.29	21.3	28.10
11	63.82	10.86	3.110	0.20(0.06)	0.30	21.6	19.00
12	61.73	12.07	2.929	0.20(0.06)	0.30	22.3	7.00
13	60.59	12.66	2.851	0.20(0.06)	0.30	22.5	20.00
14	60.23	12.83	2.829	0.20(0.06)	0.30	22.6	4.00
15	58.37	13.62	2.735	0.20(0.06)	0.30	22.7	33.00

```
COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      65.78    Tc(MIN.) =     9.72
EFFECTIVE AREA(ACRES) =      20.75   AREA-AVERAGED Fm(INCH/HR) =  0.06
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.29
TOTAL AREA(ACRES) =       22.7
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     46.00 =    1683.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     46.00 TO NODE     50.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   768.80  DOWNSTREAM(FEET) =   760.00
FLOW LENGTH(FEET) =    55.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =  30.11
```

```
ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =       65.78
PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    9.75
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     50.00 =    1738.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
TIME OF CONCENTRATION(MIN.) =    9.75
RAINFALL INTENSITY(INCH/HR) =   3.31
AREA-AVERAGED Fm(INCH/HR) =  0.06
AREA-AVERAGED Fp(INCH/HR) =  0.20
AREA-AVERAGED Ap =  0.29
EFFECTIVE STREAM AREA(ACRES) =       20.75
TOTAL STREAM AREA(ACRES) =       22.70
PEAK FLOW RATE(CFS) AT CONFLUENCE =       65.78

****************************************************************************
FLOW PROCESS FROM NODE     47.00 TO NODE     48.00 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) =    792.50  DOWNSTREAM(FEET) =    788.50

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.308
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.039
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        0.12      0.20     0.900    75   11.31
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.900
SUBAREA RUNOFF(CFS) =       0.31
TOTAL AREA(ACRES) =       0.12   PEAK FLOW RATE(CFS) =       0.31

****************************************************************************
FLOW PROCESS FROM NODE     48.00 TO NODE     49.00 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    788.50  DOWNSTREAM(FEET) =    774.00
CHANNEL LENGTH THRU SUBAREA(FEET) =  1050.00   CHANNEL SLOPE =  0.0138
CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   2.000
MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.529
SUBAREA LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
```

```
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
RESIDENTIAL
".4 DWELLING/ACRE"          D        1.28      0.20     0.900    75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.900
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.67
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.04
AVERAGE FLOW DEPTH(FEET) =   0.45   TRAVEL TIME(MIN.) =   4.34
Tc(MIN.) =   15.64
SUBAREA AREA(ACRES) =     1.28       SUBAREA RUNOFF(CFS) =    2.71
EFFECTIVE AREA(ACRES) =      1.40     AREA-AVERAGED Fm(INCH/HR) =   0.18
AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.90
TOTAL AREA(ACRES) =        1.4         PEAK FLOW RATE(CFS) =       2.96

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.56   FLOW VELOCITY(FEET/SEC.) =   4.69
LONGEST FLOWPATH FROM NODE     47.00 TO NODE     49.00 =    1350.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     49.00 TO NODE     50.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   774.00  DOWNSTREAM(FEET) =   760.00
FLOW LENGTH(FEET) =    65.00   MANNING'S N =  0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =  14.69
ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =       2.96
PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =   15.72
LONGEST FLOWPATH FROM NODE     47.00 TO NODE     50.00 =    1415.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
MAINLINE Tc(MIN.) =   15.72
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.522
SUBAREA LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
RESIDENTIAL
".4 DWELLING/ACRE"          D        1.76      0.20     0.900    75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.900
SUBAREA AREA(ACRES) =    1.76      SUBAREA RUNOFF(CFS) =    3.71
EFFECTIVE AREA(ACRES) =      3.16   AREA-AVERAGED Fm(INCH/HR) =  0.18
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.90
TOTAL AREA(ACRES) =        3.2       PEAK FLOW RATE(CFS) =       6.66

****************************************************************************
FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   15.72
RAINFALL INTENSITY(INCH/HR) =   2.52
AREA-AVERAGED Fm(INCH/HR) =  0.18
AREA-AVERAGED Fp(INCH/HR) =  0.20
AREA-AVERAGED Ap =  0.90
EFFECTIVE STREAM AREA(ACRES) =        3.16
TOTAL STREAM AREA(ACRES) =        3.16
PEAK FLOW RATE(CFS) AT CONFLUENCE =        6.66
```

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	54.35	6.03	4.339	0.20(0.06)	0.29	12.7	36.00
1	58.50	7.12	3.948	0.20(0.06)	0.29	15.1	39.00
1	63.24	8.50	3.573	0.20(0.06)	0.29	18.2	26.00
1	63.44	8.55	3.559	0.20(0.06)	0.29	18.4	30.00
1	64.03	8.78	3.507	0.20(0.06)	0.29	18.9	23.00
1	64.21	8.86	3.490	0.20(0.06)	0.29	19.0	12.00
1	64.86	9.18	3.420	0.20(0.06)	0.29	19.7	39.10
1	65.76	9.73	3.308	0.20(0.06)	0.29	20.7	15.00
1	65.78	9.75	3.306	0.20(0.06)	0.29	20.7	43.00
1	64.83	10.37	3.192	0.20(0.06)	0.29	21.3	28.10
1	63.82	10.89	3.105	0.20(0.06)	0.30	21.6	19.00
1	61.73	12.11	2.924	0.20(0.06)	0.30	22.3	7.00
1	60.59	12.69	2.847	0.20(0.06)	0.30	22.5	20.00
1	60.23	12.87	2.825	0.20(0.06)	0.30	22.6	4.00
1	58.37	13.66	2.732	0.20(0.06)	0.30	22.7	33.00
2	6.66	15.72	2.522	0.20(0.18)	0.90	3.2	47.00

```
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	58.89	6.03	4.339	0.20(0.07)	0.34	13.9	36.00
2	63.36	7.12	3.948	0.20(0.07)	0.34	16.6	39.00
3	68.46	8.50	3.573	0.20(0.07)	0.34	19.9	26.00
4	68.67	8.55	3.559	0.20(0.07)	0.34	20.1	30.00
5	69.32	8.78	3.507	0.20(0.07)	0.34	20.6	23.00
6	69.51	8.86	3.490	0.20(0.07)	0.34	20.8	12.00
7	70.24	9.18	3.420	0.20(0.07)	0.34	21.5	39.10
8	71.27	9.73	3.308	0.20(0.07)	0.34	22.7	15.00
9	71.29	9.75	3.306	0.20(0.07)	0.34	22.7	43.00
10	70.48	10.37	3.192	0.20(0.07)	0.35	23.3	28.10
11	69.59	10.89	3.105	0.20(0.07)	0.35	23.8	19.00
12	67.74	12.11	2.924	0.20(0.07)	0.36	24.7	7.00
13	66.71	12.69	2.847	0.20(0.07)	0.36	25.1	20.00
14	66.39	12.87	2.825	0.20(0.07)	0.36	25.2	4.00
15	64.68	13.66	2.732	0.20(0.07)	0.37	25.4	33.00
16	60.47	15.72	2.522	0.20(0.07)	0.37	25.9	47.00

```
COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =       71.29    Tc(MIN.) =      9.75
EFFECTIVE AREA(ACRES) =       22.71   AREA-AVERAGED Fm(INCH/HR) =  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.34
TOTAL AREA(ACRES) =        25.9
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     50.00 =    1738.00 FEET.
==============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)      =        25.9  TC(MIN.) =       9.75
EFFECTIVE AREA(ACRES) =      22.71  AREA-AVERAGED Fm(INCH/HR)=  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.344
PEAK FLOW RATE(CFS)    =       71.29
```

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	58.89	6.03	4.339	0.20(0.07)	0.34	13.9	36.00
2	63.36	7.12	3.948	0.20(0.07)	0.34	16.6	39.00
3	68.46	8.50	3.573	0.20(0.07)	0.34	19.9	26.00
4	68.67	8.55	3.559	0.20(0.07)	0.34	20.1	30.00
5	69.32	8.78	3.507	0.20(0.07)	0.34	20.6	23.00
6	69.51	8.86	3.490	0.20(0.07)	0.34	20.8	12.00
7	70.24	9.18	3.420	0.20(0.07)	0.34	21.5	39.10
8	71.27	9.73	3.308	0.20(0.07)	0.34	22.7	15.00
9	71.29	9.75	3.306	0.20(0.07)	0.34	22.7	43.00
10	70.48	10.37	3.192	0.20(0.07)	0.35	23.3	28.10
11	69.59	10.89	3.105	0.20(0.07)	0.35	23.8	19.00
12	67.74	12.11	2.924	0.20(0.07)	0.36	24.7	7.00
13	66.71	12.69	2.847	0.20(0.07)	0.36	25.1	20.00
14	66.39	12.87	2.825	0.20(0.07)	0.36	25.2	4.00
15	64.68	13.66	2.732	0.20(0.07)	0.37	25.4	33.00
16	60.47	15.72	2.522	0.20(0.07)	0.37	25.9	47.00

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

```
****************************************************************************
              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 **************************
* W.O. 2118-8, EL TORO MATERIALS                                           *
* 100-YR STUDY                                                             *
* PROPOSED CONDITION                                                       *
 ****************************************************************************

  FILE NAME: ELTORO-P.DAT
  TIME/DATE OF STUDY: 13:11 02/18/2014
============================================================================
  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 = 0.90
  *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   18.0     13.0    0.017/0.017/0.020   0.50    1.50 0.0313 0.125 0.0150
  2   16.0     11.0    0.017/0.017/0.020   0.50    1.50 0.0313 0.125 0.0150

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

****************************************************************************
  FLOW PROCESS FROM NODE       1.00 TO NODE       2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   292.00
  ELEVATION DATA: UPSTREAM(FEET) =    792.80  DOWNSTREAM(FEET) =    789.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.991
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.420
  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
  "8-10 DWELLINGS/ACRE"       D        0.61      0.20      0.400    91    8.99
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  SUBAREA RUNOFF(CFS) =       2.38
  TOTAL AREA(ACRES) =       0.61   PEAK FLOW RATE(CFS) =       2.38

****************************************************************************
  FLOW PROCESS FROM NODE       2.00 TO NODE       3.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  789.70  DOWNSTREAM ELEVATION(FEET) =  784.60
  STREET LENGTH(FEET) =   422.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 18.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  13.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.017
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.017

  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) =       4.22
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.35
    HALFSTREET FLOOD WIDTH(FEET) =   13.18
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.64
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.94
  STREET FLOW TRAVEL TIME(MIN.) =   2.66   Tc(MIN.) =   11.66
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.810
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "8-10 DWELLINGS/ACRE"       D        1.09      0.20      0.400    91
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  SUBAREA AREA(ACRES) =    1.09      SUBAREA RUNOFF(CFS) =    3.66
  EFFECTIVE AREA(ACRES) =      1.70    AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.40
  TOTAL AREA(ACRES) =        1.7        PEAK FLOW RATE(CFS) =       5.71

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.39   HALFSTREET FLOOD WIDTH(FEET) =  15.00
```

```
  FLOW VELOCITY(FEET/SEC.) =  2.80   DEPTH*VELOCITY(FT*FT/SEC.) =   1.08
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     714.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.66
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.810
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "8-10 DWELLINGS/ACRE"      D        1.21      0.20      0.400    91
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  SUBAREA AREA(ACRES) =    1.21      SUBAREA RUNOFF(CFS) =    4.06
  EFFECTIVE AREA(ACRES) =      2.91   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.40
  TOTAL AREA(ACRES) =        2.9       PEAK FLOW RATE(CFS) =       9.77

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   292.00
  ELEVATION DATA: UPSTREAM(FEET) =    792.50  DOWNSTREAM(FEET) =    787.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.273
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.636
  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
  "8-10 DWELLINGS/ACRE"      D        0.62      0.20      0.400    91    8.27
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  SUBAREA RUNOFF(CFS) =      2.54
  TOTAL AREA(ACRES) =      0.62   PEAK FLOW RATE(CFS) =      2.54

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      9.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  787.80  DOWNSTREAM ELEVATION(FEET) =  780.00
  STREET LENGTH(FEET) =   518.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 18.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  13.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.017
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.017

  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) =       4.87
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.36
    HALFSTREET FLOOD WIDTH(FEET) =   13.38
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.96
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.06
  STREET FLOW TRAVEL TIME(MIN.) =   2.91   Tc(MIN.) =   11.19
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.900
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "8-10 DWELLINGS/ACRE"      D        1.35      0.20      0.400    91
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  SUBAREA AREA(ACRES) =    1.35      SUBAREA RUNOFF(CFS) =    4.64
  EFFECTIVE AREA(ACRES) =      1.97   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.40
  TOTAL AREA(ACRES) =        2.0       PEAK FLOW RATE(CFS) =       6.77

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.39   HALFSTREET FLOOD WIDTH(FEET) =  15.31
  FLOW VELOCITY(FEET/SEC.) =  3.20   DEPTH*VELOCITY(FT*FT/SEC.) =   1.25
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE      9.00 =     810.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE      9.00 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.) =   11.19
  RAINFALL INTENSITY(INCH/HR) =   3.90
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.40
  EFFECTIVE STREAM AREA(ACRES) =       1.97
  TOTAL STREAM AREA(ACRES) =       1.97
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.77

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      8.00 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) =    792.50  DOWNSTREAM(FEET) =    787.00
```

```
Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =     7.734
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.819
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
"8-10 DWELLINGS/ACRE"       D        0.54      0.20      0.400    91    7.73
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
SUBAREA RUNOFF(CFS) =       2.30
TOTAL AREA(ACRES) =       0.54   PEAK FLOW RATE(CFS) =       2.30

****************************************************************************
FLOW PROCESS FROM NODE       8.00 TO NODE       9.00 IS CODE =  62
----------------------------------------------------------------------------
>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
UPSTREAM ELEVATION(FEET) =  787.00  DOWNSTREAM ELEVATION(FEET) =  780.00
STREET LENGTH(FEET) =   470.00   CURB HEIGHT(INCHES) =  6.0
STREET HALFWIDTH(FEET) = 18.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  13.00
INSIDE STREET CROSSFALL(DECIMAL) =  0.017
OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.017

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) =       4.37
  STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
  STREET FLOW DEPTH(FEET) =  0.35
  HALFSTREET FLOOD WIDTH(FEET) =   12.87
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.85
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.00
STREET FLOW TRAVEL TIME(MIN.) =   2.74   Tc(MIN.) =   10.48
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.049
SUBAREA LOSS RATE DATA(AMC III):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
RESIDENTIAL
"8-10 DWELLINGS/ACRE"       D        1.15      0.20      0.400    91
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
SUBAREA AREA(ACRES) =     1.15      SUBAREA RUNOFF(CFS) =     4.11
EFFECTIVE AREA(ACRES) =       1.69    AREA-AVERAGED Fm(INCH/HR) =  0.08
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.40
TOTAL AREA(ACRES) =         1.7        PEAK FLOW RATE(CFS) =       6.04

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.38   HALFSTREET FLOOD WIDTH(FEET) =  14.70
FLOW VELOCITY(FEET/SEC.) =  3.08   DEPTH*VELOCITY(FT*FT/SEC.) =   1.17
LONGEST FLOWPATH FROM NODE       7.00 TO NODE       9.00 =     745.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE       9.00 TO NODE       9.00 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.) =   10.48
RAINFALL INTENSITY(INCH/HR) =   4.05
AREA-AVERAGED Fm(INCH/HR) =  0.08
AREA-AVERAGED Fp(INCH/HR) =  0.20
AREA-AVERAGED Ap =  0.40
EFFECTIVE STREAM AREA(ACRES) =       1.69
TOTAL STREAM AREA(ACRES) =       1.69
PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.04

** CONFLUENCE DATA **
 STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
    1        6.77   11.19    3.900  0.20( 0.08) 0.40       2.0       4.00
    2        6.04   10.48    4.049  0.20( 0.08) 0.40       1.7       7.00

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       12.63   10.48    4.049  0.20( 0.08) 0.40       3.5       7.00
    2       12.58   11.19    3.900  0.20( 0.08) 0.40       3.7       4.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =       12.63    Tc(MIN.) =    10.48
EFFECTIVE AREA(ACRES) =       3.54   AREA-AVERAGED Fm(INCH/HR) =  0.08
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.40
TOTAL AREA(ACRES) =         3.7
LONGEST FLOWPATH FROM NODE       4.00 TO NODE       9.00 =     810.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE       9.00 TO NODE      14.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   780.00  DOWNSTREAM(FEET) =   777.00
FLOW LENGTH(FEET) =   298.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   7.02
ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =       12.63
PIPE TRAVEL TIME(MIN.) =   0.71    Tc(MIN.) =   11.19
LONGEST FLOWPATH FROM NODE       4.00 TO NODE      14.00 =    1108.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     14.00 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.) =   11.19
  RAINFALL INTENSITY(INCH/HR) =   3.90
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.40
  EFFECTIVE STREAM AREA(ACRES) =        3.54
  TOTAL STREAM AREA(ACRES) =        3.66
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       12.63

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   137.00
  ELEVATION DATA: UPSTREAM(FEET) =    781.50  DOWNSTREAM(FEET) =    779.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.961
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.594
  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
  "8-10 DWELLINGS/ACRE"       D        0.25      0.20      0.400    91    5.96
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  SUBAREA RUNOFF(CFS) =       1.24
  TOTAL AREA(ACRES) =       0.25   PEAK FLOW RATE(CFS) =       1.24

****************************************************************************
  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) =  779.00  DOWNSTREAM ELEVATION(FEET) =  777.00
  STREET LENGTH(FEET) =   246.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 18.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  13.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.017
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.017

  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) =       2.48
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.33
    HALFSTREET FLOOD WIDTH(FEET) =   11.45
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.00
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.65
  STREET FLOW TRAVEL TIME(MIN.) =   2.05   Tc(MIN.) =    8.01
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.724
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA       Fp          Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "8-10 DWELLINGS/ACRE"       D        0.59      0.20      0.400    91
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  SUBAREA AREA(ACRES) =    0.59      SUBAREA RUNOFF(CFS) =    2.47
  EFFECTIVE AREA(ACRES) =      0.84    AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.40
  TOTAL AREA(ACRES) =        0.8        PEAK FLOW RATE(CFS) =       3.51

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  13.28
  FLOW VELOCITY(FEET/SEC.) =  2.17   DEPTH*VELOCITY(FT*FT/SEC.) =   0.77
  LONGEST FLOWPATH FROM NODE     12.00 TO NODE     14.00 =     383.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     14.00 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.) =    8.01
  RAINFALL INTENSITY(INCH/HR) =   4.72
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.40
  EFFECTIVE STREAM AREA(ACRES) =       0.84
  TOTAL STREAM AREA(ACRES) =       0.84
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.51

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       12.63   11.19    3.901  0.20( 0.08) 0.40       3.5       7.00
      1       12.58   11.89    3.766  0.20( 0.08) 0.40       3.7       4.00
      2        3.51    8.01    4.724  0.20( 0.08) 0.40       0.8      12.00

  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        14.50    8.01    4.724  0.20( 0.08) 0.40        3.4       12.00
    2        15.52   11.19    3.901  0.20( 0.08) 0.40        4.4        7.00
    3        15.37   11.89    3.766  0.20( 0.08) 0.40        4.5        4.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       15.52    Tc(MIN.) =     11.19
  EFFECTIVE AREA(ACRES) =        4.38   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.40
  TOTAL AREA(ACRES) =         4.5
  LONGEST FLOWPATH FROM NODE       4.00 TO NODE      14.00 =     1108.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      14.00 TO NODE      41.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   777.00  DOWNSTREAM(FEET) =   771.80
  FLOW LENGTH(FEET) =    53.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   9.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.64
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       15.52
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =   11.24
  LONGEST FLOWPATH FROM NODE       4.00 TO NODE      41.00 =     1161.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      41.00 TO NODE      41.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE      15.00 TO NODE      16.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   185.00
  ELEVATION DATA: UPSTREAM(FEET) =    785.80  DOWNSTREAM(FEET) =    782.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.394
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.924
  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    5.39
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =       0.64
  TOTAL AREA(ACRES) =       0.12   PEAK FLOW RATE(CFS) =       0.64

****************************************************************************
  FLOW PROCESS FROM NODE      16.00 TO NODE      18.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  782.20  DOWNSTREAM ELEVATION(FEET) =  780.40
  STREET LENGTH(FEET) =   153.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 18.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  13.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.017
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.017

  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) =       1.50
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.28
    HALFSTREET FLOOD WIDTH(FEET) =    8.50
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.04
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.56
  STREET FLOW TRAVEL TIME(MIN.) =   1.25   Tc(MIN.) =    6.64
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.257
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "8-10 DWELLINGS/ACRE"      D        0.37      0.20     0.400    91
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  SUBAREA AREA(ACRES) =    0.37      SUBAREA RUNOFF(CFS) =    1.72
  EFFECTIVE AREA(ACRES) =       0.49    AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.33
  TOTAL AREA(ACRES) =         0.5        PEAK FLOW RATE(CFS) =       2.29

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.30   HALFSTREET FLOOD WIDTH(FEET) =  10.23
  FLOW VELOCITY(FEET/SEC.) =  2.26   DEPTH*VELOCITY(FT*FT/SEC.) =   0.69
  LONGEST FLOWPATH FROM NODE      15.00 TO NODE      18.00 =     338.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      18.00 TO NODE      18.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    6.64
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.257
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       D        0.44      0.20     0.200    91
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
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SUBAREA AREA(ACRES) =     0.44      SUBAREA RUNOFF(CFS) =     2.07
EFFECTIVE AREA(ACRES) =       0.93   AREA-AVERAGED Fm(INCH/HR) =  0.05
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.27
TOTAL AREA(ACRES) =         0.9       PEAK FLOW RATE(CFS) =       4.36

****************************************************************************
FLOW PROCESS FROM NODE     18.00 TO NODE     22.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =  780.40  DOWNSTREAM(FEET) =   777.90
FLOW LENGTH(FEET) =   153.00   MANNING'S N =  0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   6.53
ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =       4.36
PIPE TRAVEL TIME(MIN.) =   0.39    Tc(MIN.) =    7.04
LONGEST FLOWPATH FROM NODE     15.00 TO NODE     22.00 =     491.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     22.00 TO NODE     22.00 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  3
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
TIME OF CONCENTRATION(MIN.) =    7.04
RAINFALL INTENSITY(INCH/HR) =   5.09
AREA-AVERAGED Fm(INCH/HR) =  0.05
AREA-AVERAGED Fp(INCH/HR) =  0.20
AREA-AVERAGED Ap =  0.27
EFFECTIVE STREAM AREA(ACRES) =       0.93
TOTAL STREAM AREA(ACRES) =       0.93
PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.36

****************************************************************************
FLOW PROCESS FROM NODE     19.00 TO NODE     22.00 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) =    783.00  DOWNSTREAM(FEET) =    777.90

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.272
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.637
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
"8-10 DWELLINGS/ACRE"       D        0.47      0.20      0.400    91    8.27
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
SUBAREA RUNOFF(CFS) =       1.93
TOTAL AREA(ACRES) =       0.47   PEAK FLOW RATE(CFS) =       1.93

****************************************************************************
FLOW PROCESS FROM NODE     22.00 TO NODE     22.00 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  3
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =    8.27
RAINFALL INTENSITY(INCH/HR) =   4.64
AREA-AVERAGED Fm(INCH/HR) =  0.08
AREA-AVERAGED Fp(INCH/HR) =  0.20
AREA-AVERAGED Ap =  0.40
EFFECTIVE STREAM AREA(ACRES) =       0.47
TOTAL STREAM AREA(ACRES) =       0.47
PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.93

****************************************************************************
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) =   259.00
ELEVATION DATA: UPSTREAM(FEET) =    787.30  DOWNSTREAM(FEET) =    783.30

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.951
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.743
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
"8-10 DWELLINGS/ACRE"       D        0.56      0.20      0.400    91    7.95
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
SUBAREA RUNOFF(CFS) =       2.35
TOTAL AREA(ACRES) =       0.56   PEAK FLOW RATE(CFS) =       2.35

****************************************************************************
FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  62
----------------------------------------------------------------------------
>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
UPSTREAM ELEVATION(FEET) =  783.30  DOWNSTREAM ELEVATION(FEET) =  777.90
STREET LENGTH(FEET) =   340.00   CURB HEIGHT(INCHES) =  6.0
STREET HALFWIDTH(FEET) = 16.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  11.00
INSIDE STREET CROSSFALL(DECIMAL) =  0.017
OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.017

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
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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) =       3.96
  STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
  STREET FLOW DEPTH(FEET) =  0.34
  HALFSTREET FLOOD WIDTH(FEET) =   12.18
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.86
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.97
STREET FLOW TRAVEL TIME(MIN.) =   1.98   Tc(MIN.) =    9.93
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.176
SUBAREA LOSS RATE DATA(AMC III):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
RESIDENTIAL
"8-10 DWELLINGS/ACRE"       D        0.87      0.20      0.400    91
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
SUBAREA AREA(ACRES) =    0.87      SUBAREA RUNOFF(CFS) =    3.21
EFFECTIVE AREA(ACRES) =       1.43    AREA-AVERAGED Fm(INCH/HR) =  0.08
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.40
TOTAL AREA(ACRES) =         1.4        PEAK FLOW RATE(CFS) =       5.27

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  13.72
FLOW VELOCITY(FEET/SEC.) =  3.06   DEPTH*VELOCITY(FT*FT/SEC.) =   1.11
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =     599.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     22.00 TO NODE     22.00 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  3
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
TIME OF CONCENTRATION(MIN.) =    9.93
RAINFALL INTENSITY(INCH/HR) =   4.18
AREA-AVERAGED Fm(INCH/HR) =  0.08
AREA-AVERAGED Fp(INCH/HR) =  0.20
AREA-AVERAGED Ap =  0.40
EFFECTIVE STREAM AREA(ACRES) =       1.43
TOTAL STREAM AREA(ACRES) =       1.43
PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.27

** CONFLUENCE DATA **
 STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
    1        4.36    7.04    5.088  0.20( 0.05) 0.27       0.9      15.00
    2        1.93    8.27    4.637  0.20( 0.08) 0.40       0.5      19.00
    3        5.27    9.93    4.176  0.20( 0.08) 0.40       1.4      20.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR  3 STREAMS.
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** PEAK FLOW RATE TABLE **
 STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
    1       10.72    7.04    5.088  0.20( 0.07) 0.35       2.3      15.00
    2       10.78    8.27    4.637  0.20( 0.07) 0.35       2.6      19.00
    3       10.57    9.93    4.176  0.20( 0.07) 0.36       2.8      20.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      10.78    Tc(MIN.) =     8.27
EFFECTIVE AREA(ACRES) =       2.59   AREA-AVERAGED Fm(INCH/HR) =  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.35
TOTAL AREA(ACRES) =         2.8
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =     599.00 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) =   777.90  DOWNSTREAM(FEET) =   777.30
FLOW LENGTH(FEET) =    37.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   8.06
ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =      10.78
PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    8.35
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     25.00 =     636.00 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.) =    8.35
RAINFALL INTENSITY(INCH/HR) =   4.61
AREA-AVERAGED Fm(INCH/HR) =  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.20
AREA-AVERAGED Ap =  0.35
EFFECTIVE STREAM AREA(ACRES) =       2.59
TOTAL STREAM AREA(ACRES) =       2.83
PEAK FLOW RATE(CFS) AT CONFLUENCE =      10.78

****************************************************************************
FLOW PROCESS FROM NODE     23.00 TO NODE     24.00 IS CODE =  21
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
INITIAL SUBAREA FLOW-LENGTH(FEET) =   147.00
ELEVATION DATA: UPSTREAM(FEET) =    782.50  DOWNSTREAM(FEET) =    780.30

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.185
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* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.060
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       0.11      0.20      0.100    91    5.19
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
SUBAREA RUNOFF(CFS) =       0.60
TOTAL AREA(ACRES) =       0.11   PEAK FLOW RATE(CFS) =       0.60

****************************************************************************
FLOW PROCESS FROM NODE      24.00 TO NODE      25.00 IS CODE =  62
----------------------------------------------------------------------------
>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
UPSTREAM ELEVATION(FEET) =  780.30  DOWNSTREAM ELEVATION(FEET) =  777.30
STREET LENGTH(FEET) =   151.00   CURB HEIGHT(INCHES) =  6.0
STREET HALFWIDTH(FEET) = 18.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  13.00
INSIDE STREET CROSSFALL(DECIMAL) =  0.017
OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.017

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) =       1.50
  STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
  STREET FLOW DEPTH(FEET) =  0.26
  HALFSTREET FLOOD WIDTH(FEET) =    7.49
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.50
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.65
STREET FLOW TRAVEL TIME(MIN.) =   1.00   Tc(MIN.) =    6.19
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.475
SUBAREA LOSS RATE DATA(AMC III):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
RESIDENTIAL
"8-10 DWELLINGS/ACRE"       D        0.37      0.20      0.400    91
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
SUBAREA AREA(ACRES) =     0.37      SUBAREA RUNOFF(CFS) =     1.80
EFFECTIVE AREA(ACRES) =       0.48    AREA-AVERAGED Fm(INCH/HR) =  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.33
TOTAL AREA(ACRES) =         0.5        PEAK FLOW RATE(CFS) =       2.34

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   9.21
FLOW VELOCITY(FEET/SEC.) =  2.77   DEPTH*VELOCITY(FT*FT/SEC.) =   0.80
LONGEST FLOWPATH FROM NODE     23.00 TO NODE     25.00 =     298.00 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.) =    6.19
RAINFALL INTENSITY(INCH/HR) =   5.47
AREA-AVERAGED Fm(INCH/HR) =  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.20
AREA-AVERAGED Ap =  0.33
EFFECTIVE STREAM AREA(ACRES) =       0.48
TOTAL STREAM AREA(ACRES) =       0.48
PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.34

** CONFLUENCE DATA **
 STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
    1       10.72    7.11    5.056  0.20( 0.07) 0.35       2.3      15.00
    1       10.78    8.35    4.612  0.20( 0.07) 0.35       2.6      19.00
    1       10.57   10.01    4.158  0.20( 0.07) 0.36       2.8      20.00
    2        2.34    6.19    5.475  0.20( 0.07) 0.33       0.5      23.00

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       12.45    6.19    5.475  0.20( 0.07) 0.34       2.5      23.00
    2       12.88    7.11    5.056  0.20( 0.07) 0.34       2.8      15.00
    3       12.74    8.35    4.612  0.20( 0.07) 0.35       3.1      19.00
    4       12.34   10.01    4.158  0.20( 0.07) 0.35       3.3      20.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      12.88    Tc(MIN.) =     7.11
EFFECTIVE AREA(ACRES) =       2.82   AREA-AVERAGED Fm(INCH/HR) =  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.34
TOTAL AREA(ACRES) =        3.3
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     25.00 =     636.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      25.00 TO NODE      28.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   777.30  DOWNSTREAM(FEET) =   774.50
FLOW LENGTH(FEET) =   180.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  21.0 INCH PIPE IS  12.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   8.40
ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =      12.88
PIPE TRAVEL TIME(MIN.) =   0.36    Tc(MIN.) =    7.47
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     28.00 =     816.00 FEET.
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```
****************************************************************************
  FLOW PROCESS FROM NODE     28.00 TO NODE     28.00 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.) =    7.47
  RAINFALL INTENSITY(INCH/HR) =   4.92
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.34
  EFFECTIVE STREAM AREA(ACRES) =        2.82
  TOTAL STREAM AREA(ACRES) =        3.31
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       12.88

****************************************************************************
  FLOW PROCESS FROM NODE     26.00 TO NODE     27.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   147.00
  ELEVATION DATA: UPSTREAM(FEET) =    780.50  DOWNSTREAM(FEET) =    778.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.185
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.060
  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        0.11      0.20     0.100    91    5.19
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =       0.60
  TOTAL AREA(ACRES) =       0.11   PEAK FLOW RATE(CFS) =       0.60

****************************************************************************
  FLOW PROCESS FROM NODE     27.00 TO NODE     28.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  778.30  DOWNSTREAM ELEVATION(FEET) =  774.50
  STREET LENGTH(FEET) =   170.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 18.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  13.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.017
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.017

  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) =       1.47
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.25
    HALFSTREET FLOOD WIDTH(FEET) =    7.18
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.62
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.66
  STREET FLOW TRAVEL TIME(MIN.) =   1.08   Tc(MIN.) =    6.27
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.436
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "8-10 DWELLINGS/ACRE"       D        0.36      0.20     0.400    91
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  SUBAREA AREA(ACRES) =    0.36      SUBAREA RUNOFF(CFS) =    1.74
  EFFECTIVE AREA(ACRES) =       0.47    AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.33
  TOTAL AREA(ACRES) =         0.5         PEAK FLOW RATE(CFS) =       2.27

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.28   HALFSTREET FLOOD WIDTH(FEET) =   8.81
  FLOW VELOCITY(FEET/SEC.) =  2.91   DEPTH*VELOCITY(FT*FT/SEC.) =   0.82
  LONGEST FLOWPATH FROM NODE     26.00 TO NODE     28.00 =     317.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     28.00 TO NODE     28.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    6.27
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.436
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "8-10 DWELLINGS/ACRE"       D        0.47      0.20     0.400    91
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  SUBAREA AREA(ACRES) =    0.47      SUBAREA RUNOFF(CFS) =    2.27
  EFFECTIVE AREA(ACRES) =       0.94   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.36
  TOTAL AREA(ACRES) =         0.9        PEAK FLOW RATE(CFS) =       4.54

****************************************************************************
  FLOW PROCESS FROM NODE     28.00 TO NODE     28.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.27
  RAINFALL INTENSITY(INCH/HR) =   5.44
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.20
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AREA-AVERAGED Ap =  0.36
EFFECTIVE STREAM AREA(ACRES) =        0.94
TOTAL STREAM AREA(ACRES) =        0.94
PEAK FLOW RATE(CFS) AT CONFLUENCE =        4.54

** CONFLUENCE DATA **
 STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
    1       12.45    6.55    5.300  0.20( 0.07) 0.34       2.5      23.00
    1       12.88    7.47    4.916  0.20( 0.07) 0.34       2.8      15.00
    1       12.74    8.71    4.503  0.20( 0.07) 0.35       3.1      19.00
    1       12.34   10.38    4.071  0.20( 0.07) 0.35       3.3      20.00
    2        4.54    6.27    5.436  0.20( 0.07) 0.36       0.9      26.00

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       16.76    6.27    5.436  0.20( 0.07) 0.35       3.4      26.00
    2       16.88    6.55    5.300  0.20( 0.07) 0.35       3.5      23.00
    3       16.98    7.47    4.916  0.20( 0.07) 0.35       3.8      15.00
    4       16.49    8.71    4.503  0.20( 0.07) 0.35       4.0      19.00
    5       15.72   10.38    4.071  0.20( 0.07) 0.36       4.2      20.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =       16.98    Tc(MIN.) =      7.47
EFFECTIVE AREA(ACRES) =        3.76   AREA-AVERAGED Fm(INCH/HR) =  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.35
TOTAL AREA(ACRES) =        4.2
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     28.00 =     816.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     28.00 TO NODE     29.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   774.50  DOWNSTREAM(FEET) =   774.30
FLOW LENGTH(FEET) =    36.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  27.0 INCH PIPE IS  17.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   6.08
ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =       16.98
PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =     7.57
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     29.00 =     852.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     29.00 TO NODE     29.00 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.) =     7.57
RAINFALL INTENSITY(INCH/HR) =    4.88
AREA-AVERAGED Fm(INCH/HR) =  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.20
AREA-AVERAGED Ap =  0.35
EFFECTIVE STREAM AREA(ACRES) =        3.76
TOTAL STREAM AREA(ACRES) =        4.25
PEAK FLOW RATE(CFS) AT CONFLUENCE =       16.98

****************************************************************************
FLOW PROCESS FROM NODE     28.10 TO NODE     28.20 IS CODE =  21
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
INITIAL SUBAREA FLOW-LENGTH(FEET) =   265.00
ELEVATION DATA: UPSTREAM(FEET) =    779.50  DOWNSTREAM(FEET) =    774.80

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.805
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.794
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
"8-10 DWELLINGS/ACRE"       D        0.55      0.20      0.400    91    7.81
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
SUBAREA RUNOFF(CFS) =       2.33
TOTAL AREA(ACRES) =       0.55   PEAK FLOW RATE(CFS) =       2.33

****************************************************************************
FLOW PROCESS FROM NODE     28.20 TO NODE     29.00 IS CODE =  62
----------------------------------------------------------------------------
>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
UPSTREAM ELEVATION(FEET) =  774.80  DOWNSTREAM ELEVATION(FEET) =  774.30
STREET LENGTH(FEET) =    62.00   CURB HEIGHT(INCHES) =  6.0
STREET HALFWIDTH(FEET) = 18.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  13.00
INSIDE STREET CROSSFALL(DECIMAL) =  0.017
OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.017

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) =       3.15
  STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
  STREET FLOW DEPTH(FEET) =  0.35
  HALFSTREET FLOOD WIDTH(FEET) =   12.77
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.09
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.73
STREET FLOW TRAVEL TIME(MIN.) =   0.49   Tc(MIN.) =    8.30
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* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.628
SUBAREA LOSS RATE DATA(AMC III):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
RESIDENTIAL
"8-10 DWELLINGS/ACRE"       D        0.40      0.20      0.400    91
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
SUBAREA AREA(ACRES) =     0.40      SUBAREA RUNOFF(CFS) =     1.64
EFFECTIVE AREA(ACRES) =       0.95    AREA-AVERAGED Fm(INCH/HR) =  0.08
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.40
TOTAL AREA(ACRES) =         1.0        PEAK FLOW RATE(CFS) =       3.89

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.37   HALFSTREET FLOOD WIDTH(FEET) =  13.89
FLOW VELOCITY(FEET/SEC.) =  2.21   DEPTH*VELOCITY(FT*FT/SEC.) =   0.81
LONGEST FLOWPATH FROM NODE     28.10 TO NODE     29.00 =     327.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     29.00 TO NODE     29.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
MAINLINE Tc(MIN.) =    8.30
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.628
SUBAREA LOSS RATE DATA(AMC III):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
RESIDENTIAL
"8-10 DWELLINGS/ACRE"       D        0.55      0.20      0.400    91
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
SUBAREA AREA(ACRES) =     0.55      SUBAREA RUNOFF(CFS) =     2.25
EFFECTIVE AREA(ACRES) =       1.50    AREA-AVERAGED Fm(INCH/HR) =  0.08
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.40
TOTAL AREA(ACRES) =         1.5        PEAK FLOW RATE(CFS) =       6.14

****************************************************************************
FLOW PROCESS FROM NODE     29.00 TO NODE     29.00 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.) =    8.30
RAINFALL INTENSITY(INCH/HR) =   4.63
AREA-AVERAGED Fm(INCH/HR) =  0.08
AREA-AVERAGED Fp(INCH/HR) =  0.20
AREA-AVERAGED Ap =  0.40
EFFECTIVE STREAM AREA(ACRES) =       1.50
TOTAL STREAM AREA(ACRES) =       1.50
PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.14

** CONFLUENCE DATA **
 STREAM       Q       Tc    Intensity   Fp(Fm)      Ap      Ae     HEADWATER
 NUMBER     (CFS)   (MIN.)  (INCH/HR)  (INCH/HR)            (ACRES)    NODE
    1       16.76    6.37     5.388   0.20( 0.07) 0.35       3.4      26.00
    1       16.88    6.65     5.255   0.20( 0.07) 0.35       3.5      23.00
    1       16.98    7.57     4.879   0.20( 0.07) 0.35       3.8      15.00
    1       16.49    8.81     4.474   0.20( 0.07) 0.35       4.0      19.00
    1       15.72   10.48     4.048   0.20( 0.07) 0.36       4.2      20.00
    2        6.14    8.30     4.628   0.20( 0.08) 0.40       1.5      28.10

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

** PEAK FLOW RATE TABLE **
 STREAM       Q       Tc    Intensity   Fp(Fm)      Ap      Ae     HEADWATER
 NUMBER     (CFS)   (MIN.)  (INCH/HR)  (INCH/HR)            (ACRES)    NODE
    1       22.26    6.37     5.388   0.20( 0.07) 0.36       4.5      26.00
    2       22.47    6.65     5.255   0.20( 0.07) 0.36       4.7      23.00
    3       22.88    7.57     4.879   0.20( 0.07) 0.36       5.1      15.00
    4       22.83    8.30     4.628   0.20( 0.07) 0.36       5.4      28.10
    5       22.42    8.81     4.474   0.20( 0.07) 0.37       5.5      19.00
    6       21.08   10.48     4.048   0.20( 0.07) 0.37       5.8      20.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      22.88    Tc(MIN.) =     7.57
EFFECTIVE AREA(ACRES) =       5.13   AREA-AVERAGED Fm(INCH/HR) =  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.36
TOTAL AREA(ACRES) =         5.8
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     29.00 =     852.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     29.00 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) =   774.30  DOWNSTREAM(FEET) =   773.70
FLOW LENGTH(FEET) =   123.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  30.0 INCH PIPE IS  21.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   6.21
ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =      22.88
PIPE TRAVEL TIME(MIN.) =   0.33    Tc(MIN.) =    7.90
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     32.00 =     975.00 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.) =    7.90
RAINFALL INTENSITY(INCH/HR) =   4.76
AREA-AVERAGED Fm(INCH/HR) =  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.20
AREA-AVERAGED Ap =  0.36
EFFECTIVE STREAM AREA(ACRES) =       5.13
```

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TOTAL STREAM AREA(ACRES) =        5.75
PEAK FLOW RATE(CFS) AT CONFLUENCE =       22.88

****************************************************************************
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) =    778.00  DOWNSTREAM(FEET) =    774.50

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.499
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.324
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       0.24      0.20      0.100    91    6.50
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
SUBAREA RUNOFF(CFS) =       1.15
TOTAL AREA(ACRES) =       0.24   PEAK FLOW RATE(CFS) =       1.15

****************************************************************************
FLOW PROCESS FROM NODE      31.00 TO NODE      31.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
MAINLINE Tc(MIN.) =    6.50
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.324
SUBAREA LOSS RATE DATA(AMC III):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL                  D       0.19      0.20      0.100    91
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
SUBAREA AREA(ACRES) =     0.19      SUBAREA RUNOFF(CFS) =     0.91
EFFECTIVE AREA(ACRES) =       0.43   AREA-AVERAGED Fm(INCH/HR) =  0.02
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
TOTAL AREA(ACRES) =        0.4       PEAK FLOW RATE(CFS) =       2.05

****************************************************************************
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) =   774.50  DOWNSTREAM(FEET) =   773.70
FLOW LENGTH(FEET) =    87.00   MANNING'S N =  0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   4.30
ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =       2.05
PIPE TRAVEL TIME(MIN.) =   0.34    Tc(MIN.) =    6.84
LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =     337.00 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.) =    6.84
RAINFALL INTENSITY(INCH/HR) =   5.17
AREA-AVERAGED Fm(INCH/HR) =  0.02
AREA-AVERAGED Fp(INCH/HR) =  0.20
AREA-AVERAGED Ap =  0.10
EFFECTIVE STREAM AREA(ACRES) =       0.43
TOTAL STREAM AREA(ACRES) =       0.43
PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.05

** CONFLUENCE DATA **
 STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
    1       22.26    6.70    5.233  0.20( 0.07) 0.36       4.5      26.00
    1       22.47    6.98    5.111  0.20( 0.07) 0.36       4.7      23.00
    1       22.88    7.90    4.761  0.20( 0.07) 0.36       5.1      15.00
    1       22.83    8.63    4.526  0.20( 0.07) 0.36       5.4      28.10
    1       22.42    9.14    4.380  0.20( 0.07) 0.37       5.5      19.00
    1       21.08   10.82    3.976  0.20( 0.07) 0.37       5.8      20.00
    2        2.05    6.84    5.172  0.20( 0.02) 0.10       0.4      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       24.29    6.70    5.233  0.20( 0.07) 0.34       4.9      26.00
    2       24.42    6.84    5.172  0.20( 0.07) 0.34       5.0      30.00
    3       24.50    6.98    5.111  0.20( 0.07) 0.34       5.1      23.00
    4       24.77    7.90    4.761  0.20( 0.07) 0.34       5.6      15.00
    5       24.62    8.63    4.526  0.20( 0.07) 0.35       5.8      28.10
    6       24.16    9.14    4.380  0.20( 0.07) 0.35       5.9      19.00
    7       22.65   10.82    3.976  0.20( 0.07) 0.35       6.2      20.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      24.77    Tc(MIN.) =     7.90
EFFECTIVE AREA(ACRES) =       5.56   AREA-AVERAGED Fm(INCH/HR) =  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.34
TOTAL AREA(ACRES) =        6.2
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     32.00 =     975.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      32.00 TO NODE      38.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   773.70  DOWNSTREAM(FEET) =   772.30
  FLOW LENGTH(FEET) =   277.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  22.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.37
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      24.77
  PIPE TRAVEL TIME(MIN.) =   0.72    Tc(MIN.) =    8.62
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     38.00 =    1252.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     38.00 TO NODE     38.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
==============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     33.00 TO NODE     34.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   266.00
  ELEVATION DATA: UPSTREAM(FEET) =    788.00  DOWNSTREAM(FEET) =    784.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.207
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.658
  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
  "8-10 DWELLINGS/ACRE"       D        0.53      0.20      0.400    91    8.21
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  SUBAREA RUNOFF(CFS) =       2.18
  TOTAL AREA(ACRES) =       0.53   PEAK FLOW RATE(CFS) =       2.18

****************************************************************************
  FLOW PROCESS FROM NODE     34.00 TO NODE     37.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
==============================================================================
  UPSTREAM ELEVATION(FEET) =  784.30  DOWNSTREAM ELEVATION(FEET) =  777.60
  STREET LENGTH(FEET) =   623.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  11.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.017
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.017

  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) =       4.01
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.36
    HALFSTREET FLOOD WIDTH(FEET) =   13.29
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.47
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.88
  STREET FLOW TRAVEL TIME(MIN.) =   4.21   Tc(MIN.) =   12.41
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.675
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "8-10 DWELLINGS/ACRE"       D        1.12      0.20      0.400    91
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  SUBAREA AREA(ACRES) =     1.12      SUBAREA RUNOFF(CFS) =     3.62
  EFFECTIVE AREA(ACRES) =       1.65    AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.40
  TOTAL AREA(ACRES) =         1.6        PEAK FLOW RATE(CFS) =       5.34

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.38   HALFSTREET FLOOD WIDTH(FEET) =  14.93
  FLOW VELOCITY(FEET/SEC.) =  2.65   DEPTH*VELOCITY(FT*FT/SEC.) =   1.02
  LONGEST FLOWPATH FROM NODE     33.00 TO NODE     37.00 =     889.00 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.) =   12.41
  RAINFALL INTENSITY(INCH/HR) =   3.67
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.40
  EFFECTIVE STREAM AREA(ACRES) =       1.65
  TOTAL STREAM AREA(ACRES) =       1.65
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.34

****************************************************************************
  FLOW PROCESS FROM NODE     36.00 TO NODE     37.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  ELEVATION DATA: UPSTREAM(FEET) =    778.70  DOWNSTREAM(FEET) =    777.60

  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       0.18       0.20      0.100   91    5.00
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
SUBAREA RUNOFF(CFS) =       1.00
TOTAL AREA(ACRES) =       0.18   PEAK FLOW RATE(CFS) =       1.00

****************************************************************************
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.) =    5.00
RAINFALL INTENSITY(INCH/HR) =   6.19
AREA-AVERAGED Fm(INCH/HR) =  0.02
AREA-AVERAGED Fp(INCH/HR) =  0.20
AREA-AVERAGED Ap =  0.10
EFFECTIVE STREAM AREA(ACRES) =        0.18
TOTAL STREAM AREA(ACRES) =        0.18
PEAK FLOW RATE(CFS) AT CONFLUENCE =        1.00

** CONFLUENCE DATA **
 STREAM       Q      Tc   Intensity   Fp(Fm)      Ap     Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
    1        5.34   12.41    3.675  0.20( 0.08) 0.40       1.6      33.00
    2        1.00    5.00    6.187  0.20( 0.02) 0.10       0.2      36.00

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        4.65    5.00    6.187  0.20( 0.07) 0.34       0.8      36.00
    2        5.93   12.41    3.675  0.20( 0.07) 0.37       1.8      33.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =       5.93    Tc(MIN.) =    12.41
EFFECTIVE AREA(ACRES) =       1.83   AREA-AVERAGED Fm(INCH/HR) =  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.37
TOTAL AREA(ACRES) =        1.8
LONGEST FLOWPATH FROM NODE     33.00 TO NODE     37.00 =     889.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     37.00 TO NODE     38.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   777.60  DOWNSTREAM(FEET) =   772.30
FLOW LENGTH(FEET) =    49.00   MANNING'S N =  0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =  14.08
ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =       5.93
PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =   12.47
LONGEST FLOWPATH FROM NODE     33.00 TO NODE     38.00 =     938.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     38.00 TO NODE     38.00 IS CODE =  11
----------------------------------------------------------------------------
>>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

** MAIN STREAM CONFLUENCE DATA **
 STREAM       Q      Tc   Intensity   Fp(Fm)      Ap     Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
    1        4.65    5.06    6.144  0.20( 0.07) 0.34       0.8      36.00
    2        5.93   12.47    3.665  0.20( 0.07) 0.37       1.8      33.00
LONGEST FLOWPATH FROM NODE     33.00 TO NODE     38.00 =     938.00 FEET.

** MEMORY BANK #  2 CONFLUENCE DATA **
 STREAM       Q      Tc   Intensity   Fp(Fm)      Ap     Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
    1       24.29    7.42    4.933  0.20( 0.07) 0.34       4.9      26.00
    2       24.42    7.56    4.882  0.20( 0.07) 0.34       5.0      30.00
    3       24.50    7.71    4.829  0.20( 0.07) 0.34       5.1      23.00
    4       24.77    8.62    4.528  0.20( 0.07) 0.34       5.6      15.00
    5       24.62    9.36    4.321  0.20( 0.07) 0.35       5.8      28.10
    6       24.16    9.86    4.192  0.20( 0.07) 0.35       5.9      19.00
    7       22.65   11.55    3.829  0.20( 0.07) 0.35       6.2      20.00
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     38.00 =    1252.00 FEET.

** PEAK FLOW RATE TABLE **
 STREAM       Q      Tc   Intensity   Fp(Fm)      Ap     Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
    1       25.34    5.06    6.144  0.20( 0.07) 0.34       4.2      36.00
    2       29.35    7.42    4.933  0.20( 0.07) 0.34       6.1      26.00
    3       29.50    7.56    4.882  0.20( 0.07) 0.34       6.2      30.00
    4       29.61    7.71    4.829  0.20( 0.07) 0.34       6.3      23.00
    5       30.04    8.62    4.528  0.20( 0.07) 0.34       6.9      15.00
    6       30.02    9.36    4.321  0.20( 0.07) 0.35       7.3      28.10
    7       29.64    9.86    4.192  0.20( 0.07) 0.35       7.4      19.00
    8       28.43   11.55    3.829  0.20( 0.07) 0.35       7.9      20.00
    9       27.59   12.47    3.665  0.20( 0.07) 0.35       8.0      33.00
  TOTAL AREA(ACRES) =        8.0

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      30.04  Tc(MIN.) =    8.622
EFFECTIVE AREA(ACRES) =       6.88  AREA-AVERAGED Fm(INCH/HR) =  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.35
TOTAL AREA(ACRES) =        8.0
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     38.00 =    1252.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     38.00 TO NODE     38.00 IS CODE =  12
----------------------------------------------------------------------------
>>>>>CLEAR MEMORY BANK # 2 <<<<<
```

```
==============================================================================

******************************************************************************
  FLOW PROCESS FROM NODE     38.00 TO NODE     40.00 IS CODE =  31
------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   772.30  DOWNSTREAM(FEET) =   772.00
  FLOW LENGTH(FEET) =    65.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  24.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.48
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      30.04
  PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =    8.79
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     40.00 =    1317.00 FEET.

******************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =   1
------------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.79
  RAINFALL INTENSITY(INCH/HR) =   4.48
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.34
  EFFECTIVE STREAM AREA(ACRES) =       6.88
  TOTAL STREAM AREA(ACRES) =       8.01
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      30.04

******************************************************************************
  FLOW PROCESS FROM NODE     39.00 TO NODE     40.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   200.00
  ELEVATION DATA: UPSTREAM(FEET) =    778.00  DOWNSTREAM(FEET) =    776.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.357
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.392
  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        0.18      0.20      0.100    91    6.36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =       0.87
  TOTAL AREA(ACRES) =       0.18   PEAK FLOW RATE(CFS) =       0.87

******************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =   1
------------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.36
  RAINFALL INTENSITY(INCH/HR) =   5.39
  AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.18
  TOTAL STREAM AREA(ACRES) =       0.18
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.87

******************************************************************************
  FLOW PROCESS FROM NODE     39.10 TO NODE     39.20 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   283.00
  ELEVATION DATA: UPSTREAM(FEET) =    781.00  DOWNSTREAM(FEET) =    777.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.549
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.886
  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
  "11+ DWELLINGS/ACRE"        D        0.31      0.20      0.200    91    7.55
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =       1.35
  TOTAL AREA(ACRES) =       0.31   PEAK FLOW RATE(CFS) =       1.35

******************************************************************************
  FLOW PROCESS FROM NODE     39.20 TO NODE     40.00 IS CODE =  62
------------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
==============================================================================
  UPSTREAM ELEVATION(FEET) =  777.70  DOWNSTREAM ELEVATION(FEET) =  776.00
  STREET LENGTH(FEET) =   125.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 18.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  13.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.017
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.017

  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) =       2.63
```

```
  STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
  STREET FLOW DEPTH(FEET) =  0.31
  HALFSTREET FLOOD WIDTH(FEET) =   10.54
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.47
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.76
STREET FLOW TRAVEL TIME(MIN.) =   0.84   Tc(MIN.) =    8.39
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.598
SUBAREA LOSS RATE DATA(AMC III):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
RESIDENTIAL
"5-7 DWELLINGS/ACRE"        D        0.63      0.20      0.500    91
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.500
SUBAREA AREA(ACRES) =     0.63      SUBAREA RUNOFF(CFS) =     2.55
EFFECTIVE AREA(ACRES) =       0.94    AREA-AVERAGED Fm(INCH/HR) =  0.08
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.40
TOTAL AREA(ACRES) =         0.9        PEAK FLOW RATE(CFS) =       3.82

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =  12.36
FLOW VELOCITY(FEET/SEC.) =  2.69   DEPTH*VELOCITY(FT*FT/SEC.) =   0.92
LONGEST FLOWPATH FROM NODE     39.10 TO NODE     40.00 =     408.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  3
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
TIME OF CONCENTRATION(MIN.) =    8.39
RAINFALL INTENSITY(INCH/HR) =   4.60
AREA-AVERAGED Fm(INCH/HR) =  0.08
AREA-AVERAGED Fp(INCH/HR) =  0.20
AREA-AVERAGED Ap =  0.40
EFFECTIVE STREAM AREA(ACRES) =       0.94
TOTAL STREAM AREA(ACRES) =       0.94
PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.82

** CONFLUENCE DATA **
 STREAM       Q       Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
 NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)            (ACRES)    NODE
    1       25.34    5.24    6.024  0.20( 0.07) 0.34       4.2      36.00
    1       29.35    7.59    4.871  0.20( 0.07) 0.34       6.1      26.00
    1       29.50    7.73    4.821  0.20( 0.07) 0.34       6.2      30.00
    1       29.61    7.87    4.770  0.20( 0.07) 0.34       6.3      23.00
    1       30.04    8.79    4.478  0.20( 0.07) 0.34       6.9      15.00
    1       30.02    9.52    4.277  0.20( 0.07) 0.35       7.3      28.10
    1       29.64   10.03    4.152  0.20( 0.07) 0.35       7.4      19.00
    1       28.43   11.72    3.797  0.20( 0.07) 0.35       7.9      20.00
    1       27.59   12.64    3.636  0.20( 0.07) 0.35       8.0      33.00
    2        0.87    6.36    5.392  0.20( 0.02) 0.10       0.2      39.00
    3        3.82    8.39    4.598  0.20( 0.08) 0.40       0.9      39.10
```

```
RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR  3 STREAMS.

** PEAK FLOW RATE TABLE **
 STREAM       Q       Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
 NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)            (ACRES)    NODE
    1       29.28    5.24    6.024  0.20( 0.07) 0.34       4.9      36.00
    2       31.52    6.36    5.392  0.20( 0.07) 0.34       6.0      39.00
    3       33.80    7.59    4.871  0.20( 0.07) 0.34       7.1      26.00
    4       33.97    7.73    4.821  0.20( 0.07) 0.34       7.2      30.00
    5       34.10    7.87    4.770  0.20( 0.07) 0.34       7.3      23.00
    6       34.42    8.39    4.598  0.20( 0.07) 0.34       7.7      39.10
    7       34.48    8.79    4.478  0.20( 0.07) 0.35       8.0      15.00
    8       34.26    9.52    4.277  0.20( 0.07) 0.35       8.4      28.10
    9       33.75   10.03    4.152  0.20( 0.07) 0.35       8.5      19.00
   10       32.18   11.72    3.797  0.20( 0.07) 0.35       9.0      20.00
   11       31.19   12.64    3.636  0.20( 0.07) 0.35       9.1      33.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =       34.48    Tc(MIN.) =     8.79
EFFECTIVE AREA(ACRES) =       8.00   AREA-AVERAGED Fm(INCH/HR) =  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.35
TOTAL AREA(ACRES) =         9.1
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     40.00 =    1317.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     40.00 TO NODE     41.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   772.00  DOWNSTREAM(FEET) =   771.80
FLOW LENGTH(FEET) =    38.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  33.0 INCH PIPE IS  25.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   6.97
ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =       34.48
PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    8.88
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     41.00 =    1355.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     41.00 TO NODE     41.00 IS CODE =  11
----------------------------------------------------------------------------
>>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

** MAIN STREAM CONFLUENCE DATA **
 STREAM       Q       Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
 NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)            (ACRES)    NODE
    1       29.28    5.33    5.964  0.20( 0.07) 0.34       4.9      36.00
    2       31.52    6.45    5.348  0.20( 0.07) 0.34       6.0      39.00
    3       33.80    7.68    4.838  0.20( 0.07) 0.34       7.1      26.00
    4       33.97    7.82    4.788  0.20( 0.07) 0.34       7.2      30.00
    5       34.10    7.96    4.739  0.20( 0.07) 0.34       7.3      23.00
    6       34.42    8.48    4.570  0.20( 0.07) 0.34       7.7      39.10
    7       34.48    8.88    4.452  0.20( 0.07) 0.35       8.0      15.00
```

```
    8       34.26    9.61    4.254  0.20( 0.07) 0.35       8.4       28.10
    9       33.75   10.12    4.130  0.20( 0.07) 0.35       8.5       19.00
   10       32.18   11.81    3.780  0.20( 0.07) 0.35       9.0       20.00
   11       31.19   12.73    3.621  0.20( 0.07) 0.35       9.1       33.00
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     41.00 =    1355.00 FEET.

** MEMORY BANK #  1 CONFLUENCE DATA **
 STREAM        Q       Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
 NUMBER      (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
    1        14.50    8.06    4.707  0.20( 0.08) 0.40       3.4       12.00
    2        15.52   11.24    3.891  0.20( 0.08) 0.40       4.4        7.00
    3        15.37   11.94    3.757  0.20( 0.08) 0.40       4.5        4.00
LONGEST FLOWPATH FROM NODE      4.00 TO NODE     41.00 =    1161.00 FEET.

** PEAK FLOW RATE TABLE **
 STREAM        Q       Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
 NUMBER      (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
    1        41.48    5.33    5.964  0.20( 0.07) 0.36       7.2       36.00
    2        44.73    6.45    5.348  0.20( 0.07) 0.36       8.7       39.00
    3        48.02    7.68    4.838  0.20( 0.07) 0.36      10.3       26.00
    4        48.29    7.82    4.788  0.20( 0.07) 0.36      10.5       30.00
    5        48.53    7.96    4.739  0.20( 0.07) 0.36      10.7       23.00
    6        48.66    8.06    4.707  0.20( 0.07) 0.36      10.8       12.00
    7        49.05    8.48    4.570  0.20( 0.07) 0.36      11.2       39.10
    8        49.25    8.88    4.452  0.20( 0.07) 0.36      11.6       15.00
    9        49.25    9.61    4.254  0.20( 0.07) 0.36      12.2       28.10
   10        48.91   10.12    4.130  0.20( 0.07) 0.37      12.6       19.00
   11        48.24   11.24    3.891  0.20( 0.07) 0.37      13.2        7.00
   12        47.58   11.81    3.780  0.20( 0.07) 0.37      13.5       20.00
   13        47.41   11.94    3.757  0.20( 0.07) 0.37      13.5        4.00
   14        45.99   12.73    3.621  0.20( 0.07) 0.37      13.6       33.00
  TOTAL AREA(ACRES) =        13.6

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =       49.25  Tc(MIN.) =     9.613
EFFECTIVE AREA(ACRES) =     12.24  AREA-AVERAGED Fm(INCH/HR) =  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.36
TOTAL AREA(ACRES) =       13.6
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     41.00 =    1355.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     41.00 TO NODE     41.00 IS CODE =  12
----------------------------------------------------------------------------
>>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
FLOW PROCESS FROM NODE     41.00 TO NODE     46.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   771.80  DOWNSTREAM(FEET) =   768.80
FLOW LENGTH(FEET) =   328.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  36.0 INCH PIPE IS  24.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   9.54
ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =       49.25
PIPE TRAVEL TIME(MIN.) =   0.57    Tc(MIN.) =   10.19
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     46.00 =    1683.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     46.00 TO NODE     46.00 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.) =   10.19
RAINFALL INTENSITY(INCH/HR) =   4.12
AREA-AVERAGED Fm(INCH/HR) =  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.20
AREA-AVERAGED Ap =  0.36
EFFECTIVE STREAM AREA(ACRES) =       12.24
TOTAL STREAM AREA(ACRES) =       13.63
PEAK FLOW RATE(CFS) AT CONFLUENCE =       49.25

****************************************************************************
FLOW PROCESS FROM NODE     43.00 TO NODE     44.00 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) =    776.80  DOWNSTREAM(FEET) =    774.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.752
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.813
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
"11+ DWELLINGS/ACRE"        D        0.85      0.20      0.200    91    7.75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
SUBAREA RUNOFF(CFS) =       3.65
TOTAL AREA(ACRES) =       0.85   PEAK FLOW RATE(CFS) =       3.65

****************************************************************************
FLOW PROCESS FROM NODE     44.00 TO NODE     45.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   774.00  DOWNSTREAM(FEET) =   770.00
FLOW LENGTH(FEET) =   400.00   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.) =   5.20
ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =       3.65
```

```
PIPE TRAVEL TIME(MIN.) =   1.28    Tc(MIN.) =    9.03
LONGEST FLOWPATH FROM NODE     43.00 TO NODE     45.00 =     680.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     45.00 TO NODE     45.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
MAINLINE Tc(MIN.) =    9.03
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.409
SUBAREA LOSS RATE DATA(AMC III):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
RESIDENTIAL
"11+ DWELLINGS/ACRE"        D        8.22      0.20      0.200    91
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
SUBAREA AREA(ACRES) =     8.22      SUBAREA RUNOFF(CFS) =    32.32
EFFECTIVE AREA(ACRES) =       9.07   AREA-AVERAGED Fm(INCH/HR) =  0.04
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.20
TOTAL AREA(ACRES) =         9.1       PEAK FLOW RATE(CFS) =       35.66

****************************************************************************
FLOW PROCESS FROM NODE     45.00 TO NODE     46.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   770.00  DOWNSTREAM(FEET) =   768.80
FLOW LENGTH(FEET) =   232.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  33.0 INCH PIPE IS  26.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   6.92
ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =       35.66
PIPE TRAVEL TIME(MIN.) =   0.56    Tc(MIN.) =    9.59
LONGEST FLOWPATH FROM NODE     43.00 TO NODE     46.00 =     912.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     46.00 TO NODE     46.00 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.) =    9.59
RAINFALL INTENSITY(INCH/HR) =   4.26
AREA-AVERAGED Fm(INCH/HR) =  0.04
AREA-AVERAGED Fp(INCH/HR) =  0.20
AREA-AVERAGED Ap =  0.20
EFFECTIVE STREAM AREA(ACRES) =       9.07
TOTAL STREAM AREA(ACRES) =       9.07
PEAK FLOW RATE(CFS) AT CONFLUENCE =      35.66

** CONFLUENCE DATA **
 STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
```

NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)		(ACRES)	NODE
1	41.48	5.93	5.609	0.20(0.07)	0.36	7.2	36.00
1	44.73	7.04	5.084	0.20(0.07)	0.36	8.7	39.00
1	48.02	8.26	4.641	0.20(0.07)	0.36	10.3	26.00
1	48.29	8.40	4.598	0.20(0.07)	0.36	10.5	30.00
1	48.53	8.54	4.553	0.20(0.07)	0.36	10.7	23.00
1	48.66	8.63	4.525	0.20(0.07)	0.36	10.8	12.00
1	49.05	9.06	4.402	0.20(0.07)	0.36	11.2	39.10
1	49.25	9.45	4.295	0.20(0.07)	0.36	11.6	15.00
1	49.25	10.19	4.115	0.20(0.07)	0.36	12.2	28.10
1	48.91	10.70	4.002	0.20(0.07)	0.37	12.6	19.00
1	48.24	11.81	3.781	0.20(0.07)	0.37	13.2	7.00
1	47.58	12.41	3.676	0.20(0.07)	0.37	13.5	20.00
1	47.41	12.54	3.654	0.20(0.07)	0.37	13.5	4.00
1	45.99	13.33	3.528	0.20(0.07)	0.37	13.6	33.00
2	35.66	9.59	4.260	0.20(0.04)	0.20	9.1	43.00

```
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	70.59	5.93	5.609	0.20(0.06)	0.29	12.8	36.00
2	76.04	7.04	5.084	0.20(0.06)	0.29	15.3	39.00
3	81.50	8.26	4.641	0.20(0.06)	0.29	18.1	26.00
4	82.00	8.40	4.598	0.20(0.06)	0.29	18.4	30.00
5	82.48	8.54	4.553	0.20(0.06)	0.29	18.8	23.00
6	82.77	8.63	4.525	0.20(0.06)	0.29	19.0	12.00
7	83.87	9.06	4.402	0.20(0.06)	0.29	19.8	39.10
8	84.69	9.45	4.295	0.20(0.06)	0.29	20.6	15.00
9	84.91	9.59	4.260	0.20(0.06)	0.29	20.8	43.00
10	83.70	10.19	4.115	0.20(0.06)	0.29	21.3	28.10
11	82.39	10.70	4.002	0.20(0.06)	0.30	21.6	19.00
12	79.85	11.81	3.781	0.20(0.06)	0.30	22.3	7.00
13	78.30	12.41	3.676	0.20(0.06)	0.30	22.6	20.00
14	77.95	12.54	3.654	0.20(0.06)	0.30	22.6	4.00
15	75.47	13.33	3.528	0.20(0.06)	0.30	22.7	33.00

```
COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      84.91    Tc(MIN.) =     9.59
EFFECTIVE AREA(ACRES) =      20.81   AREA-AVERAGED Fm(INCH/HR) =  0.06
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.29
TOTAL AREA(ACRES) =       22.7
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     46.00 =    1683.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     46.00 TO NODE     50.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   768.80  DOWNSTREAM(FEET) =   760.00
FLOW LENGTH(FEET) =    55.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  24.0 INCH PIPE IS  19.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =  31.15
```

```
ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =       84.91
PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    9.62
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     50.00 =    1738.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
TIME OF CONCENTRATION(MIN.) =    9.62
RAINFALL INTENSITY(INCH/HR) =   4.25
AREA-AVERAGED Fm(INCH/HR) =  0.06
AREA-AVERAGED Fp(INCH/HR) =  0.20
AREA-AVERAGED Ap =  0.29
EFFECTIVE STREAM AREA(ACRES) =      20.81
TOTAL STREAM AREA(ACRES) =      22.70
PEAK FLOW RATE(CFS) AT CONFLUENCE =      84.91

****************************************************************************
FLOW PROCESS FROM NODE     47.00 TO NODE     48.00 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) =    792.50  DOWNSTREAM(FEET) =    788.50

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.308
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.876
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
".4 DWELLING/ACRE"          D        0.12      0.20     0.900    91   11.31
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.900
SUBAREA RUNOFF(CFS) =       0.40
TOTAL AREA(ACRES) =       0.12   PEAK FLOW RATE(CFS) =       0.40

****************************************************************************
FLOW PROCESS FROM NODE     48.00 TO NODE     49.00 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    788.50  DOWNSTREAM(FEET) =    774.00
CHANNEL LENGTH THRU SUBAREA(FEET) =  1050.00   CHANNEL SLOPE =  0.0138
CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   2.000
MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.256
SUBAREA LOSS RATE DATA(AMC III):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
```

```
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
RESIDENTIAL
".4 DWELLING/ACRE"          D        1.28      0.20     0.900    91
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.900
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.18
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.35
AVERAGE FLOW DEPTH(FEET) =   0.50   TRAVEL TIME(MIN.) =   4.03
Tc(MIN.) =   15.33
SUBAREA AREA(ACRES) =     1.28       SUBAREA RUNOFF(CFS) =    3.54
EFFECTIVE AREA(ACRES) =      1.40     AREA-AVERAGED Fm(INCH/HR) =   0.18
AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.90
TOTAL AREA(ACRES) =        1.4          PEAK FLOW RATE(CFS) =       3.88

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.62   FLOW VELOCITY(FEET/SEC.) =   5.00
LONGEST FLOWPATH FROM NODE     47.00 TO NODE     49.00 =    1350.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     49.00 TO NODE     50.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   774.00  DOWNSTREAM(FEET) =   760.00
FLOW LENGTH(FEET) =    65.00   MANNING'S N =  0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =  15.88
ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =       3.88
PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =   15.40
LONGEST FLOWPATH FROM NODE     47.00 TO NODE     50.00 =    1415.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
MAINLINE Tc(MIN.) =   15.40
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.247
SUBAREA LOSS RATE DATA(AMC III):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
RESIDENTIAL
".4 DWELLING/ACRE"          D        1.76      0.20     0.900    91
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.900
SUBAREA AREA(ACRES) =    1.76       SUBAREA RUNOFF(CFS) =    4.86
EFFECTIVE AREA(ACRES) =      3.16   AREA-AVERAGED Fm(INCH/HR) =  0.18
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.90
TOTAL AREA(ACRES) =        3.2        PEAK FLOW RATE(CFS) =       8.72

****************************************************************************
FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 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.) =   15.40
RAINFALL INTENSITY(INCH/HR) =   3.25
AREA-AVERAGED Fm(INCH/HR) =  0.18
AREA-AVERAGED Fp(INCH/HR) =  0.20
AREA-AVERAGED Ap =  0.90
EFFECTIVE STREAM AREA(ACRES) =        3.16
TOTAL STREAM AREA(ACRES) =        3.16
PEAK FLOW RATE(CFS) AT CONFLUENCE =        8.72
```

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	70.59	5.96	5.593	0.20(0.06)	0.29	12.8	36.00
1	76.04	7.07	5.071	0.20(0.06)	0.29	15.3	39.00
1	81.50	8.29	4.632	0.20(0.06)	0.29	18.1	26.00
1	82.00	8.42	4.588	0.20(0.06)	0.29	18.4	30.00
1	82.48	8.57	4.544	0.20(0.06)	0.29	18.8	23.00
1	82.77	8.66	4.516	0.20(0.06)	0.29	19.0	12.00
1	83.87	9.09	4.394	0.20(0.06)	0.29	19.8	39.10
1	84.69	9.48	4.288	0.20(0.06)	0.29	20.6	15.00
1	84.91	9.62	4.252	0.20(0.06)	0.29	20.8	43.00
1	83.70	10.22	4.109	0.20(0.06)	0.29	21.3	28.10
1	82.39	10.73	3.995	0.20(0.06)	0.30	21.6	19.00
1	79.85	11.84	3.775	0.20(0.06)	0.30	22.3	7.00
1	78.30	12.44	3.671	0.20(0.06)	0.30	22.6	20.00
1	77.95	12.57	3.649	0.20(0.06)	0.30	22.6	4.00
1	75.47	13.36	3.523	0.20(0.06)	0.30	22.7	33.00
2	8.72	15.40	3.247	0.20(0.18)	0.90	3.2	47.00

```
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	76.55	5.96	5.593	0.20(0.07)	0.34	14.0	36.00
2	82.43	7.07	5.071	0.20(0.07)	0.34	16.8	39.00
3	88.31	8.29	4.632	0.20(0.07)	0.34	19.8	26.00
4	88.86	8.42	4.588	0.20(0.07)	0.34	20.2	30.00
5	89.39	8.57	4.544	0.20(0.07)	0.34	20.5	23.00
6	89.71	8.66	4.516	0.20(0.07)	0.34	20.7	12.00
7	90.94	9.09	4.394	0.20(0.07)	0.34	21.7	39.10
8	91.88	9.48	4.288	0.20(0.07)	0.34	22.5	15.00
9	92.14	9.62	4.252	0.20(0.07)	0.34	22.8	43.00
10	91.11	10.22	4.109	0.20(0.07)	0.35	23.4	28.10
11	89.95	10.73	3.995	0.20(0.07)	0.35	23.8	19.00
12	87.71	11.84	3.775	0.20(0.07)	0.36	24.7	7.00
13	86.32	12.44	3.671	0.20(0.07)	0.36	25.1	20.00
14	86.00	12.57	3.649	0.20(0.07)	0.36	25.2	4.00
15	83.72	13.36	3.523	0.20(0.07)	0.37	25.4	33.00
16	78.18	15.40	3.247	0.20(0.07)	0.37	25.9	47.00

```
COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =       92.14    Tc(MIN.) =      9.62
EFFECTIVE AREA(ACRES) =       22.79   AREA-AVERAGED Fm(INCH/HR) =  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.34
TOTAL AREA(ACRES) =        25.9
LONGEST FLOWPATH FROM NODE      20.00 TO NODE      50.00 =     1738.00 FEET.
==============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)      =        25.9  TC(MIN.) =       9.62
EFFECTIVE AREA(ACRES) =      22.79  AREA-AVERAGED Fm(INCH/HR)=  0.07
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.345
PEAK FLOW RATE(CFS)    =       92.14
```

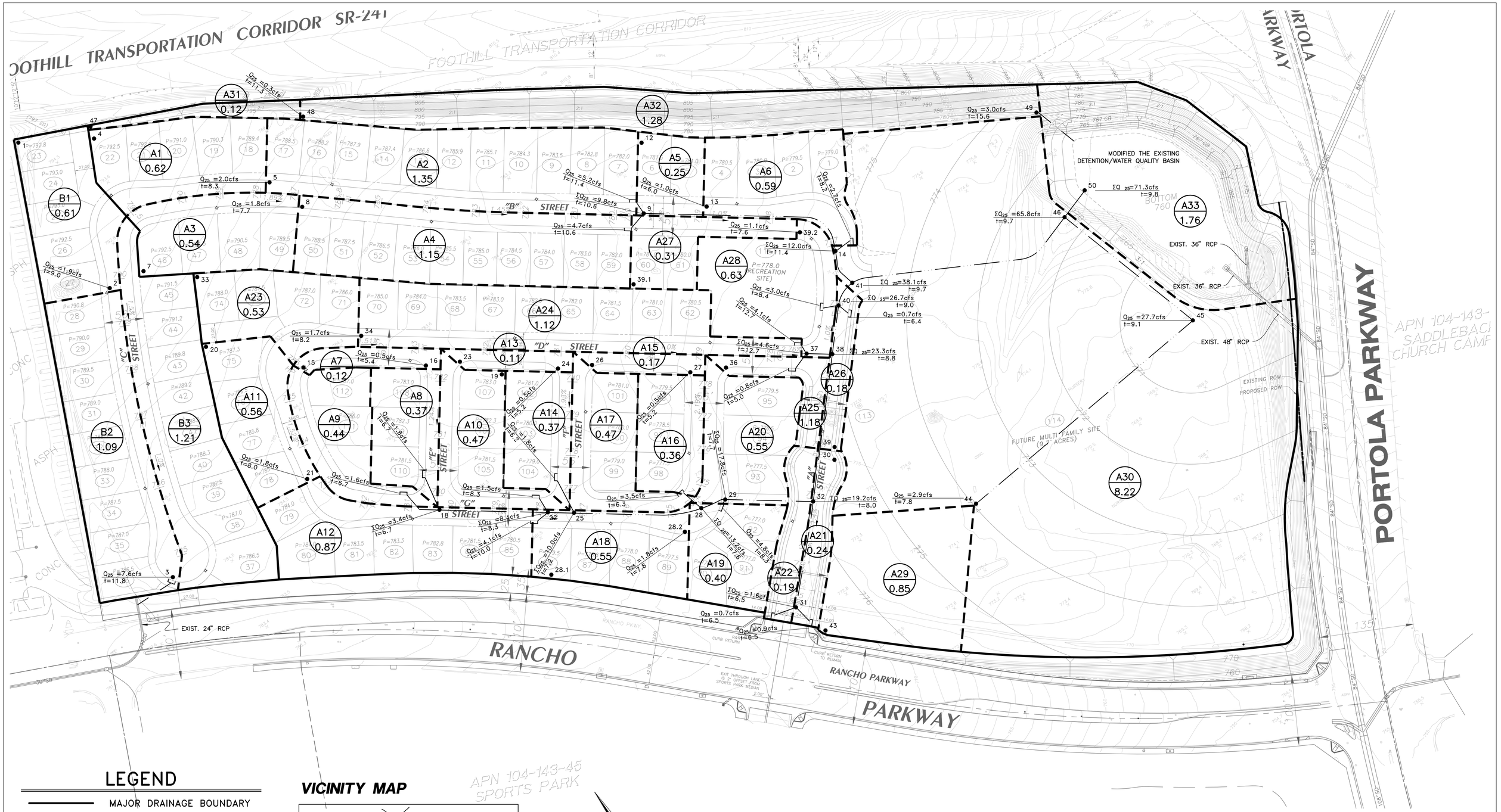
** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	76.55	5.96	5.593	0.20(0.07)	0.34	14.0	36.00
2	82.43	7.07	5.071	0.20(0.07)	0.34	16.8	39.00
3	88.31	8.29	4.632	0.20(0.07)	0.34	19.8	26.00
4	88.86	8.42	4.588	0.20(0.07)	0.34	20.2	30.00
5	89.39	8.57	4.544	0.20(0.07)	0.34	20.5	23.00
6	89.71	8.66	4.516	0.20(0.07)	0.34	20.7	12.00
7	90.94	9.09	4.394	0.20(0.07)	0.34	21.7	39.10
8	91.88	9.48	4.288	0.20(0.07)	0.34	22.5	15.00
9	92.14	9.62	4.252	0.20(0.07)	0.34	22.8	43.00
10	91.11	10.22	4.109	0.20(0.07)	0.35	23.4	28.10
11	89.95	10.73	3.995	0.20(0.07)	0.35	23.8	19.00
12	87.71	11.84	3.775	0.20(0.07)	0.36	24.7	7.00
13	86.32	12.44	3.671	0.20(0.07)	0.36	25.1	20.00
14	86.00	12.57	3.649	0.20(0.07)	0.36	25.2	4.00
15	83.72	13.36	3.523	0.20(0.07)	0.37	25.4	33.00
16	78.18	15.40	3.247	0.20(0.07)	0.37	25.9	47.00

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

SECTION 3

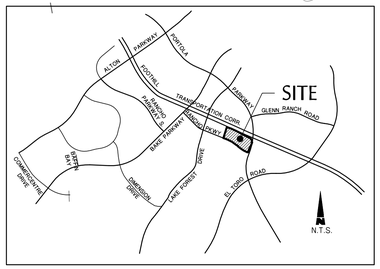
HYDROLOGY MAP



LEGEND

———	MAJOR DRAINAGE BOUNDARY
- - - -	MINOR DRAINAGE BOUNDARY
100 ●	NODE NUMBER
A / 1.0	AREA DESIGNATION / AREA ACREAGE (IN ACRES)
Q_{10} =6.0cfs, Q_{100}=8.0cfs, t=15.0, C.B. #1	PEAK FLOW RATE / TIME OF CONCENTRATION
ΣQ_{10} =8.0cfs, ΣQ_{100}=10.0cfs, t=15.0	PEAK CONFLUENCE FLOW RATE / TIME OF CONCENTRATION
—— · · ——	PROPOSED STORM DRAIN
D	SOIL GROUP

VICINITY MAP



1" = 60'

0 30 60 120 180 240

SCALE: 1" = 60'

PREPARED FOR:

BAKER RANCH PROPERTIES, LLC.
ONE UPPER NEWPORT PLAZA, BLDG. 1
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TENTATIVE TRACT MAP 17707
FOR CONDOMINIUM PURPOSES
CITY OF LAKE FOREST

WO: 2118-8, HYDRO MAP FOR TTM 17707

PLOTTED BY: tu DATE: Feb. 28, 2014 TIME: 01:47 PM L:\El Toro Materials\Engineering\Hydrology\Hydro Map Proposed-1.dwg

SECTION 4

REFERENCES

DRAINAGE REPORT

For:

LAKE FOREST SPORTS PARK

CITY OF LAKE FOREST
25550 COMMERCENTRE DRIVE SUITE 100
COUNTY OF ORANGE, CALIFORNIA

PREPARED BY:

PSOMAS

January 29, 2010

1. GENERAL DISCUSSION

This report has been prepared for the Lake Forest Sports Park project to be used for the design of drainage facilities for the rough grading. The site is located west of Portola Parkway and south of the State Highway 241 in the City of Lake Forest, Orange County, California.

The purpose of this report is to provide hydrologic and basin calculations for the design of the storm drain facilities around the proposed Sports Park and the relocation of existing facilities currently located on the site. The site is bounded on the north by a commercial site south of State Highway 241, on the east by Portola Parkway and a commercial development, south of the site by Glass Creek and on the west by an industrial development. The site is currently undeveloped and existing runoff drains to Glass Creek which discharges into Aliso Creek.

On-site storm drain improvements include the construction of desilting basins that will discharge into existing 60-inch laterals, Facility No. J01P06, west of the project and Aliso Creek confluencing with existing drainage, maintaining existing drainage patterns.

The primary objectives of this report are as follows:

1. Delineate the drainage area tributary to each proposed drainage inlet and concentration points.
2. Perform hydrologic analysis using the Orange County Rational Method to determine the design flows for sizing the proposed drainage facilities.
3. Provide calculations to size the proposed desilting basins that will detain peak run off and provide water quality protection.

HYDROLOGY

Hydrologic calculations for the design of the storm drain facilities associated with the Lake Forest Sports Park were performed in accordance with the guidelines specified in the Orange County Hydrology Manual. The hydrology for the project was performed for a 25-year frequency storm.

This hydrology report was prepared on the assertion that the existing downstream storm drain improvements are adequate to accept drainage from this project.

METHODOLOGY

The Rational Method, as described in the Orange County Hydrology Manual, was used to calculate the on-site existing and proposed peak storm runoff. Computations of these hydrology calculations were provided through the "RATOC" hydrology computer program by Advanced Engineering. The hydrology calculations are based on Soil Group D. Calculations for the existing condition were performed using Barren and Open Brush Land Use. The proposed condition calculations were performed using Barren and Commercial Land Use. Even though the site's ultimate land usage will be for a park, the calculations are based on the assumption that synthetic turf will be used on the fields resulting in 100% runoff. The final report will be revised with the correct land use factor when the City of Lake Forest provides the land cover material approved for usage on the fields.

The design discharges were calculated by modeling the project site into tributary subareas.

The attached hydrology maps depict the accumulated runoff for Subarea "A."

DESILTING BASINS

The storm water quality for the Lake Forest Sports Park will be handled through the use of earthen swales detention basins. The basins are sized using the storm water quality design flow (SQDF) according to the Orange County Drainage Area Master Plan (DAMP 2003). Detailed discussion of the post construction water quality measures to be implemented by this project can be found in the project Water Quality Management Plan (WQMP).

SUMMARY

The existing hydrology was calculated for an area of approximately 128.18 acres with peak flow of 145.91 CFS. The proposed hydrology was calculated for 127.9 acres and has a peak flow of 242.31 CFS. Desilting basins/storm water quality devices will provide treatment to the runoff before draining from the site. The proposed drainage will be similar to the existing condition: the developed site will have a net increase in peak flow of 46.4 CFS for the 25-year peak runoff leaving the project site into Aliso Creek.

25-Year

Proposed Condition– Drainage Area "A"

```
****************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
         (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
       (c) Copyright 1983-2002 Advanced Engineering Software (aes)
          Ver. 8.0  Release Date: 01/01/2002  License ID 1286

                        Analysis prepared by:

                              Psomas
                     3187 Red Hill Ave., Ste. 250
                        Costa Mesa, CA  92626


----------------------------------------------------------------------------
  FILE NAME: 2LAKHYPR.DAT
  TIME/DATE OF STUDY: 15:56 01/28/2010
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  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   0.50    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  7.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =    796.00  DOWNSTREAM(FEET) =    789.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.367
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.207
  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        1.78      0.20       0.10    75    6.37
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
SUBAREA RUNOFF(CFS) =       6.71
TOTAL AREA(ACRES) =       1.78   PEAK FLOW RATE(CFS) =       6.71

****************************************************************************
FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  56
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    789.30  DOWNSTREAM(FEET) =    776.50
CHANNEL LENGTH THRU SUBAREA(FEET) =   912.00   CHANNEL SLOPE =  0.0140
GIVEN CHANNEL BASE(FEET) =   10.00   CHANNEL FREEBOARD(FEET) =  0.5
"Z" FACTOR =   2.000   MANNING'S FACTOR = 0.013
*ESTIMATED CHANNEL HEIGHT(FEET) =   0.86
GIVEN CHANNEL BASE(FEET) =   10.00   CHANNEL FREEBOARD(FEET) =  0.5
"Z" FACTOR =   2.000   MANNING'S FACTOR = 0.013
*ESTIMATED CHANNEL HEIGHT(FEET) =   0.84
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.534
SUBAREA LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL                  D        9.97      0.20       0.10    75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     22.58
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.25
AVERAGE FLOW DEPTH(FEET) =   0.34   TRAVEL TIME(MIN.) =   2.43
Tc(MIN.) =   8.80
SUBAREA AREA(ACRES) =     9.97       SUBAREA RUNOFF(CFS) =   31.53
EFFECTIVE AREA(ACRES) =     11.75     AREA-AVERAGED Fm(INCH/HR) =   0.02
AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.10
TOTAL AREA(ACRES) =     11.75         PEAK FLOW RATE(CFS) =      37.16
GIVEN CHANNEL BASE(FEET) =   10.00   CHANNEL FREEBOARD(FEET) =  0.5
"Z" FACTOR =   2.000   MANNING'S FACTOR = 0.013
*ESTIMATED CHANNEL HEIGHT(FEET) =   0.95

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.45   FLOW VELOCITY(FEET/SEC.) =   7.49
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =  1212.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  56
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    776.50  DOWNSTREAM(FEET) =    767.50
CHANNEL LENGTH THRU SUBAREA(FEET) =   810.00   CHANNEL SLOPE =  0.0111
GIVEN CHANNEL BASE(FEET) =   10.00   CHANNEL FREEBOARD(FEET) =  0.5
"Z" FACTOR =   2.000   MANNING'S FACTOR = 0.013
*ESTIMATED CHANNEL HEIGHT(FEET) =   1.08
GIVEN CHANNEL BASE(FEET) =   10.00   CHANNEL FREEBOARD(FEET) =  0.5
"Z" FACTOR =   2.000   MANNING'S FACTOR = 0.013
```

```
*ESTIMATED CHANNEL HEIGHT(FEET) =   1.07
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.169
SUBAREA LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL                  D       7.51      0.20       0.10    75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     47.81
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   7.57
AVERAGE FLOW DEPTH(FEET) =   0.57   TRAVEL TIME(MIN.) =   1.78
Tc(MIN.) =  10.58
SUBAREA AREA(ACRES) =     7.51       SUBAREA RUNOFF(CFS) =   21.28
EFFECTIVE AREA(ACRES) =     19.26     AREA-AVERAGED Fm(INCH/HR) =   0.02
AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.10
TOTAL AREA(ACRES) =     19.26          PEAK FLOW RATE(CFS) =      54.58
GIVEN CHANNEL BASE(FEET) =   10.00   CHANNEL FREEBOARD(FEET) =  0.5
"Z" FACTOR =   2.000   MANNING'S FACTOR = 0.013
*ESTIMATED CHANNEL HEIGHT(FEET) =   1.11

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.61   FLOW VELOCITY(FEET/SEC.) =   8.01
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =  2022.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
MAINLINE Tc(MIN) =  10.58
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.169
SUBAREA LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL                  D       7.37      0.20       0.10    75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
SUBAREA AREA(ACRES) =     7.37       SUBAREA RUNOFF(CFS) =   20.89
EFFECTIVE AREA(ACRES) =     26.63    AREA-AVERAGED Fm(INCH/HR) =  0.02
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
TOTAL AREA(ACRES) =     26.63          PEAK FLOW RATE(CFS) =      75.47

****************************************************************************
FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  56
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    767.50  DOWNSTREAM(FEET) =    756.00
CHANNEL LENGTH THRU SUBAREA(FEET) =   250.00   CHANNEL SLOPE =  0.0460
GIVEN CHANNEL BASE(FEET) =   10.00   CHANNEL FREEBOARD(FEET) =  0.5
"Z" FACTOR =   2.000   MANNING'S FACTOR = 0.013
*ESTIMATED CHANNEL HEIGHT(FEET) =   1.00
GIVEN CHANNEL BASE(FEET) =   10.00   CHANNEL FREEBOARD(FEET) =  0.5
"Z" FACTOR =   2.000   MANNING'S FACTOR = 0.013
*ESTIMATED CHANNEL HEIGHT(FEET) =   1.00
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.124
```

```
SUBAREA LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL                  D       2.61      0.20       0.10    75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     79.11
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  14.36
AVERAGE FLOW DEPTH(FEET) =   0.50   TRAVEL TIME(MIN.) =   0.29
Tc(MIN.) =  10.87
SUBAREA AREA(ACRES) =     2.61       SUBAREA RUNOFF(CFS) =    7.29
EFFECTIVE AREA(ACRES) =     29.24     AREA-AVERAGED Fm(INCH/HR) =   0.02
AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.10
TOTAL AREA(ACRES) =     29.24         PEAK FLOW RATE(CFS) =      81.67
GIVEN CHANNEL BASE(FEET) =   10.00   CHANNEL FREEBOARD(FEET) =  0.5
"Z" FACTOR =   2.000   MANNING'S FACTOR = 0.013
*ESTIMATED CHANNEL HEIGHT(FEET) =   1.01

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.51   FLOW VELOCITY(FEET/SEC.) =  14.59
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =  2272.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      5.00 TO NODE      5.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
MAINLINE Tc(MIN) =  10.87
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.124
SUBAREA LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL                  D       5.93      0.20       0.10    75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
SUBAREA AREA(ACRES) =     5.93      SUBAREA RUNOFF(CFS) =   16.56
EFFECTIVE AREA(ACRES) =     35.17   AREA-AVERAGED Fm(INCH/HR) =  0.02
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
TOTAL AREA(ACRES) =     35.17       PEAK FLOW RATE(CFS) =      98.24

****************************************************************************
FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   756.00  DOWNSTREAM(FEET) =   735.74
FLOW LENGTH(FEET) =   130.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =  33.47
ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =     98.24
PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =  10.94
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 =  2402.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =  81
```

PRELIMINARY DRAINAGE STUDY

DETENTION BASIN CALCULATIONS

Baker Parcel & Rancho Parkway

Area

40.3 Ac Existing Condition: $Q_{25} = 73.5$ cfs

$T_c = 17.6$ min

35.2 Ac Proposed Condition: $Q_{25} = 98.2$ cfs

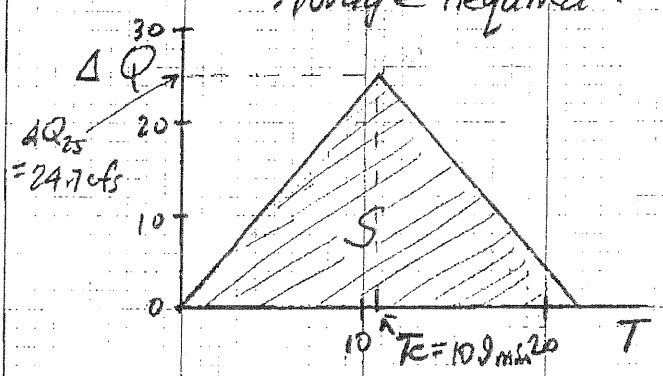
$T_c = 10.9$ min

Storage Required: $\Delta Q_{25} = 98.2 - 73.5 = 24.7$ cfs

$S = \Delta Q_{25} \times T_c$

$= 24.7 \frac{ft^3}{s} \times 10.9 \text{ min} \times \frac{60 \text{ sec}}{1 \text{ min}}$

$S = 16{,}154$ CF $= 0.37$ Ac-ft.



BAKER & RADOS PARCELS S/O RANCHO PKWY.

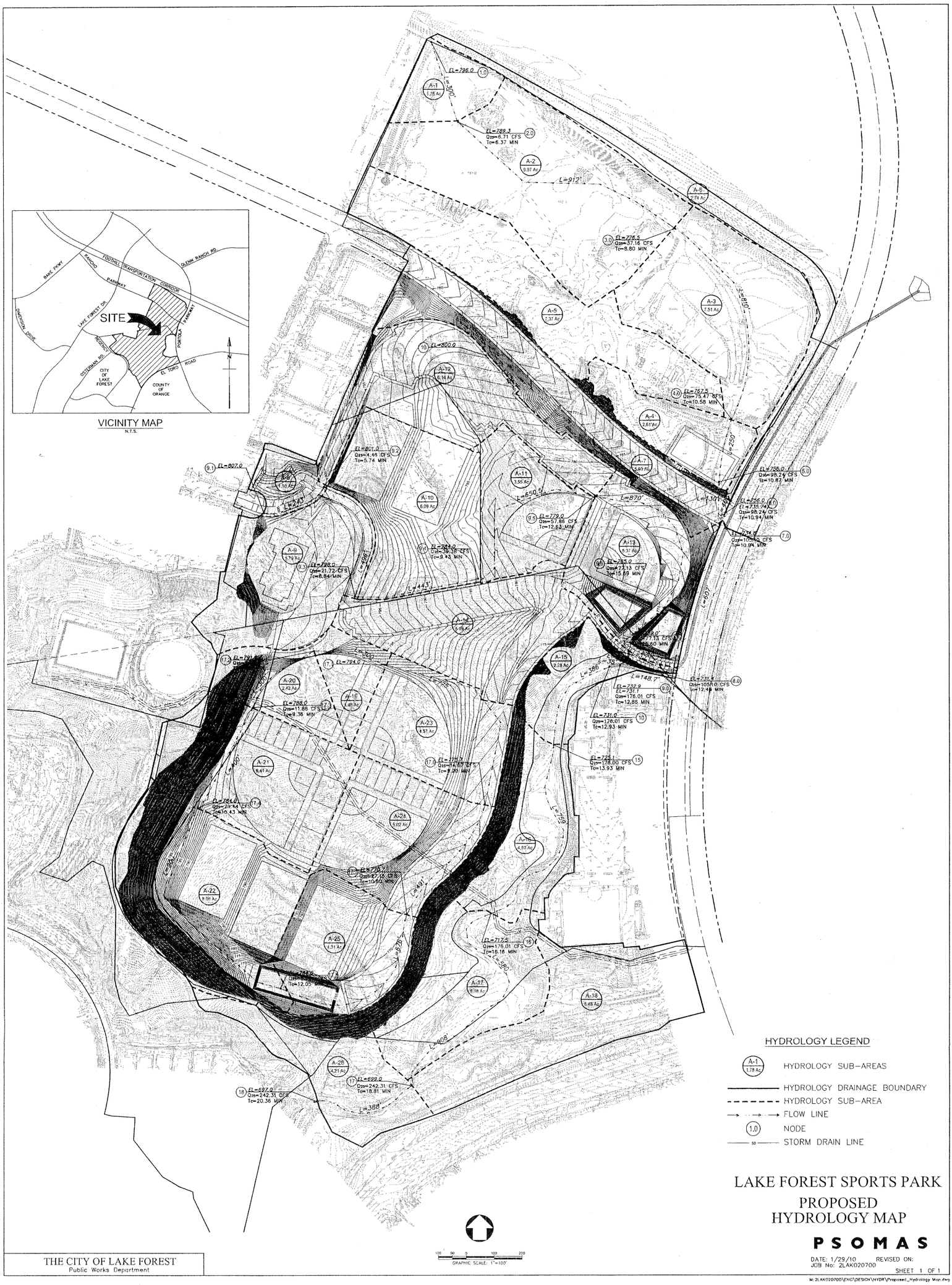
Area

12.3 Ac Existing Condition: $Q_{25} = 29.5$ cfs, $T_c = 12.6$ min.

34.0 Ac Proposed Condition: $Q_{25} = 77.1$ cfs, $T_c = 15.6$ min

Storage Required: $\Delta Q_{25} = 77.1 - 29.5 = 47.6$ cfs

$S = 44{,}554$ CF $= 1.02$ Ac-ft



LAKE FOREST SPORTS PARK

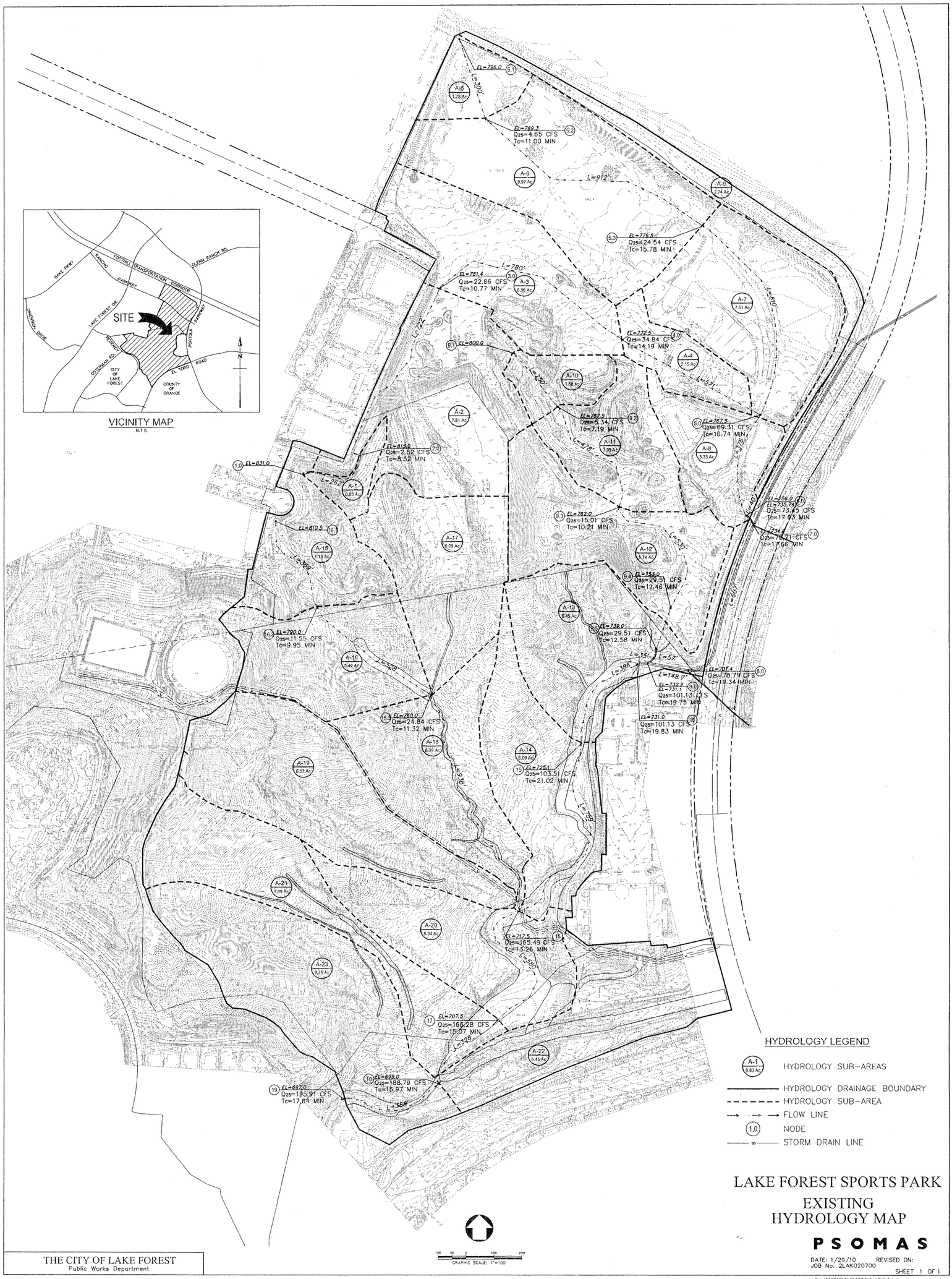
PROPOSED HYDROLOGY MAP

PSOMAS

THE CITY OF LAKE FOREST
Public Works Department

DATE: 1/29/10 REVISED ON:
JOB No: 2LAK020700
SHEET 1 OF 1

M:\2LAK020700\ENG\DESIGN\HYDR\Proposed_Hydrology Map.dwg



LAKE FOREST SPORTS PARK

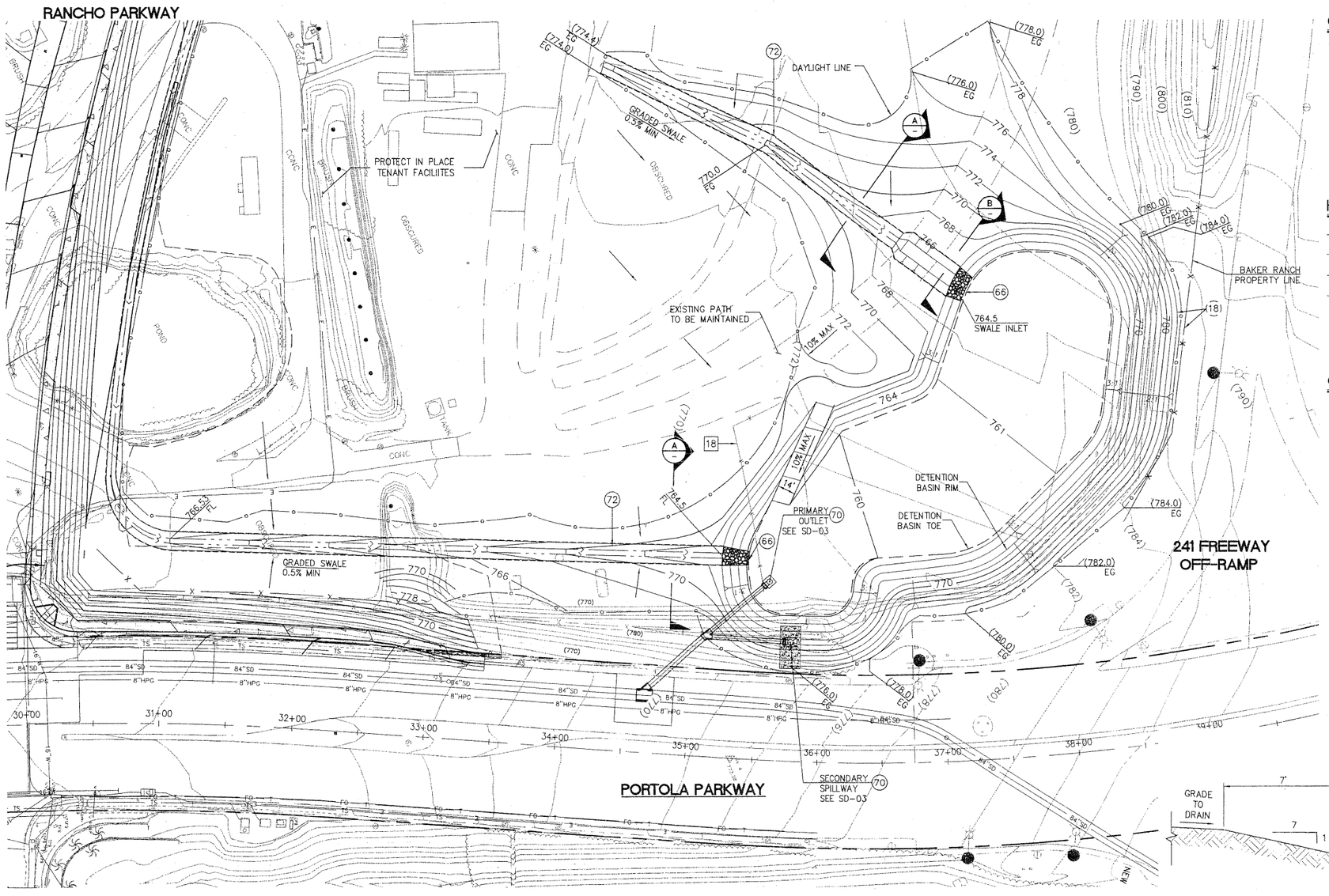
EXISTING HYDROLOGY MAP

PSOMAS

DATE: 1/29/10 REVISED ON:
JOB No: 2LAK020700
SHEET 1 OF 1

THE CITY OF LAKE FOREST
Public Works Department

M:\2LAK020700\ENG\DESIGN\HYDR\Existing_Hydrology Map.dwg



40' 20' 0' 40' 80'

GRAPHIC SCALE

Note: For reduced sized prints, original scale is in inches

CONSTRUCTION NOTES:

ALL OBJECTS TO BE REMOVED WITHIN PROJECT LIMINTS UNLESS OTHERWISE NOTED.

- ○ CONSTRUCT
- ◯ RELOCATE EXISTING
- □ REMOVE
- ⬚ ADJUST EXISTING TO GRADE

18. CHAIN LINK FENCE
66. RIP RAP, ¼ TON CLASS
70. INLET TYPE V PER OCRDMD STD PLAN 1305, PIPE SIZE PER PLAN AND PROFILE
72. GRADED SWALE, SLOPE PER PLAN (SEE TYP SEC FOR DETAILS)

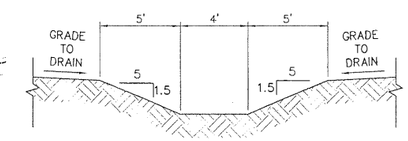
HATCH / LINE LEGEND

- —E— EXISTING ELECTRICAL
- —G— EXISTING GAS
- —FO— EXISTING FIBER OPTIC
- —W— EXISTING WATER
- —SD— EXISTING STORM DRAIN
- —T— EXISTING TELECOMMUNICATION
- —SS— EXISTING SANITARY SEWER

GENERAL NOTES

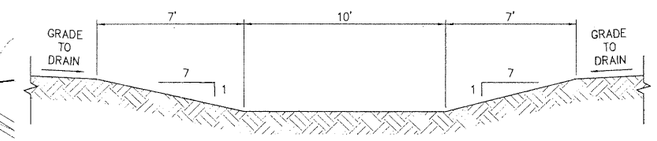
SWALE NOTES:

1. THE CONTRACTOR SHALL COORDINATE THE LOCATION OF ONE 24' WIDE AREA FOR PASSENGER VEHICLES TO CROSS OVER THE SWALE CLOSEST TO PORTOLA WITH THE ENGINEER AND PROPERTY OWNER PRIOR TO GRADING.
2. THE SWALE LOCATION MAY MOVE SLIGHTLY WEST TO STAY AWAY FROM TENANTS ALONG PORTOLA.
3. UNLESS OTHERWISE DIRECTED, THE EXISTING TRAVEL PATH PARALLEL TO PORTOLA IS TO REMAIN IN USE AND THE NEW SWALE IS TO BE LOCATED WEST OF THAT.



GRADED SWALE TYPICAL SECTION (A)

NOT TO SCALE



GRADED SWALE DRIVEABLE SECTION (B)

NOT TO SCALE

Underground Service Alert of Southern California
Call: TOLL FREE 1-800 227-2600
TWO WORKING DAYS BEFORE YOU DIG

NO.	DATE	REVISIONS	APP.	DATE

PLANS PREPARED BY:

PSOMAS

3 Hutton Centre Drive, Suite 200
Santa Ana, CA 92707
(714) 751-7373 Fax (714) 545-8883

Dec. 20, 2011
ANISSA VOYIATZES, P.E., RCE 57710

REGISTERED PROFESSIONAL ENGINEER ANISSA VOYIATZES No. 57710 Exp. 12/31/13 CIVIL STATE OF CALIFORNIA

STREET IMPROVEMENT PLANS
RANCHO PARKWAY IMPROVEMENT PROJECT
BAKER RANCH DETENTION BASIN

THE CITY OF LAKE FOREST
Public Works Department

DB-01

PROJECT NO. PW 2009.06

SHEET 18 OF 46

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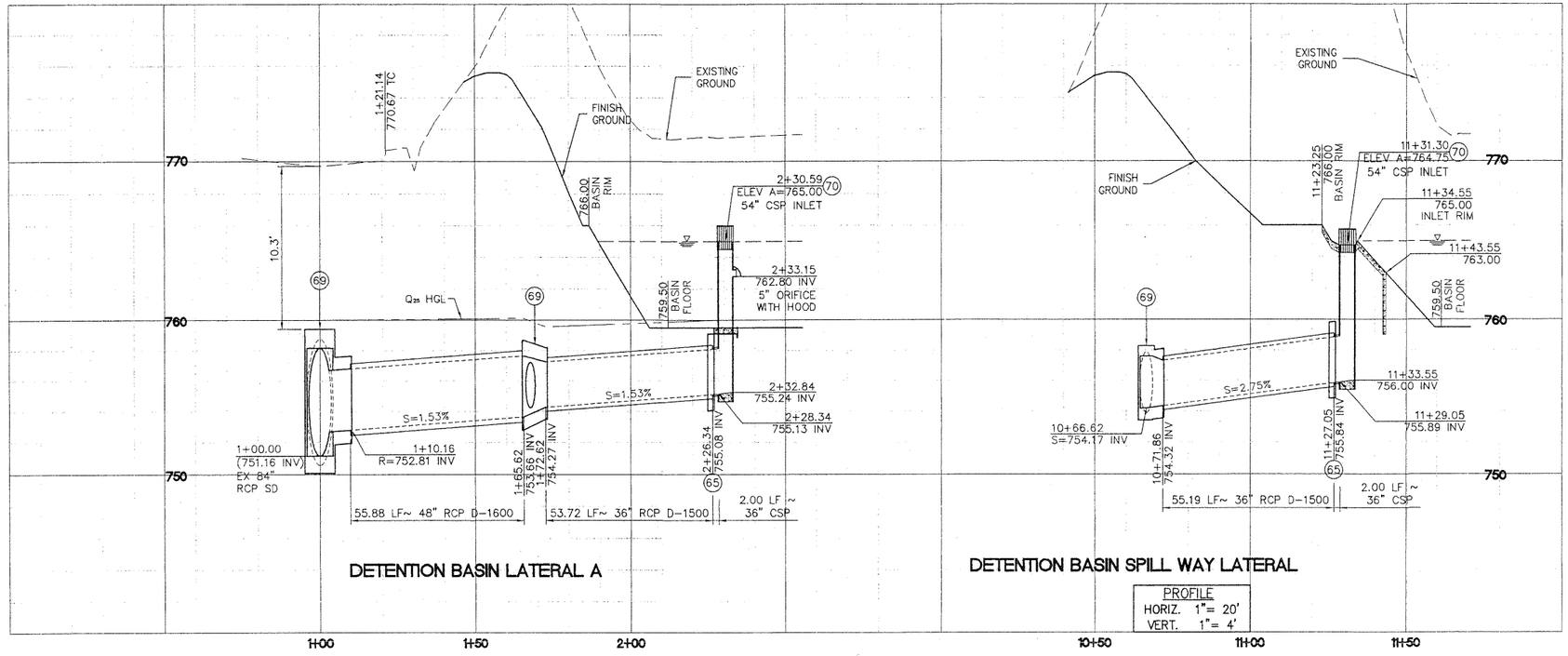

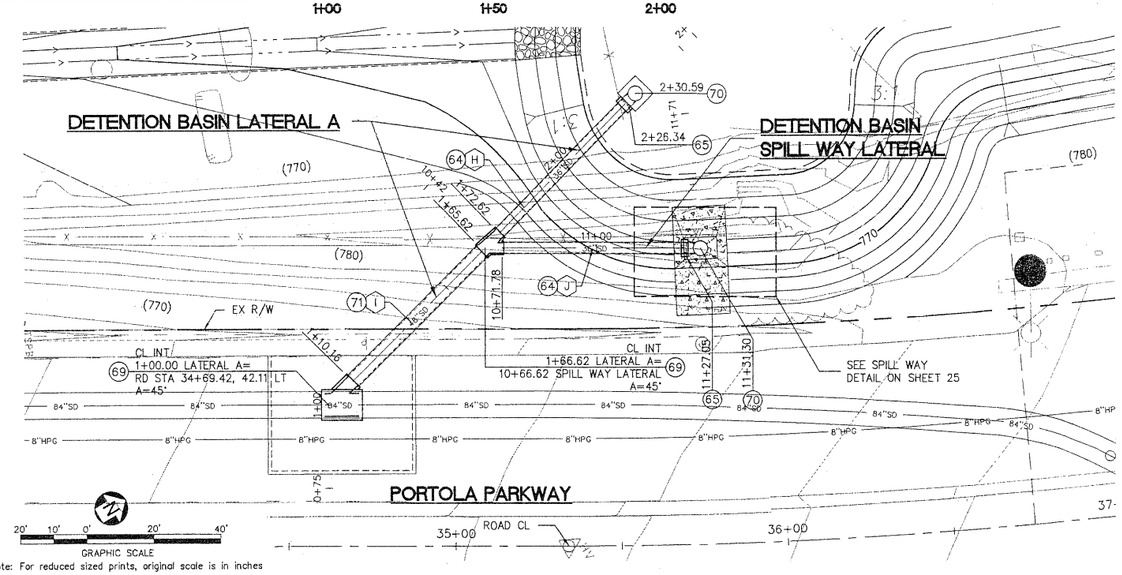

Note: For reduced sized prints, original scale is in inches

LINE / CURVE TABLE

#	DELTA/BRG	RADIUS	LENGTH	TANGENT
H	N 14°20'15" W	–	55.88'	–
I	N 14°20'15" W	–	53.72'	–
J	N 30°39'45" E	–	53.19'	–

NOTE TO CONTRACTOR:

LOCATION OF EXISTING UTILITIES ARE APPROXIMATE AND DEPTH IS UNKNOWN. CONTRACTOR SHALL VERIFY THE LOCATION AND DEPTH OF ALL UTILITIES PRIOR TO THE START OF EXCAVATION. CONTRACTOR SHALL TAKE CARE DURING EXCAVATION AND PROTECT IN PLACE ALL UTILITIES ENCOUNTERED. DAMAGED UTILITY FACILITIES SHALL BE REPAIRED AT NO ADDITIONAL COST.

LINE LEGEND

- —E— EXISTING ELECTRICAL
- —FO— EXISTING FIBER OPTIC
- —G— EXISTING GAS
- —SD— EXISTING STORM DRAIN
- —SL— EXISTING STREET LIGHT CONDUIT
- —SS— EXISTING SANITARY SEWER
- —T— EXISTING TELECOMMUNICATION
- —W— EXISTING WATER
- POTHOLE LOCATION

CONSTRUCTION NOTES:

ALL OBJECTS WITHIN PROJECT LIMITS TO BE REMOVED UNLESS OTHERWISE NOTED.

- ◯ CONSTRUCT
- ◯ RELOCATE EXISTING
- ☐ REMOVE
- ⬚ ADJUST EXISTING TO GRADE

64. 36" RCP, D-LOAD PER PROFILE
65. CONCRETE COLLAR PER OCRDMD STD PLAN 1317
69. JUNCTION STRUCTURE TYPE III, WITH NO MANHOLE, PER OCRDMD STD PLAN 1312
70. INLET TYPE V PER OCRDMD STD PLAN 1305, PIPE SIZE PER PLAN AND PROFILE
71. 48" RCP, D-LOAD PER PROFILE.

GENERAL NOTES:

1. PIPE BEDDING SHALL CONFORM TO DETAIL ON SHEET 21.
2. CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIALS.
3. CONTRACTOR SHALL VERIFY BY SUBSURFACE INVESTIGATION EXACT SIZE AND LOCATION (HORIZONTAL AND VERTICAL) OF EXISTING CROSSING AND JOINING UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY THE ENGINEER 72 HOURS PRIOR TO EXCAVATION.

Underground Service Alert of Southern California
Call: TOLL FREE 1-800 227-2600
TWO WORKING DAYS BEFORE YOU DIG

NO.	DATE	REVISIONS	APP.	DATE

PLANS PREPARED BY:
PSOMAS
3 Hutton Centre Drive, Suite 200
Santa Ana, CA 92707
(714) 751-7373 Fax (714) 545-8883
Dec. 20, 2011
ANISSA VOYIATZES, P.E., RCE 57710
REGISTERED PROFESSIONAL ENGINEER ANISSA VOYIATZES No. 57710 Exp. 12/31/13 CIVIL STATE OF CALIFORNIA

STREET IMPROVEMENT PLANS
RANCHO PARKWAY IMPROVEMENT PROJECT
STORM DRAIN – DETENTION BASIN AND SPILLWAY LATERALS

THE CITY OF LAKE FOREST
Public Works Department

SD-03
PROJECT NO. PW 2009.06
SHEET 23 OF 46

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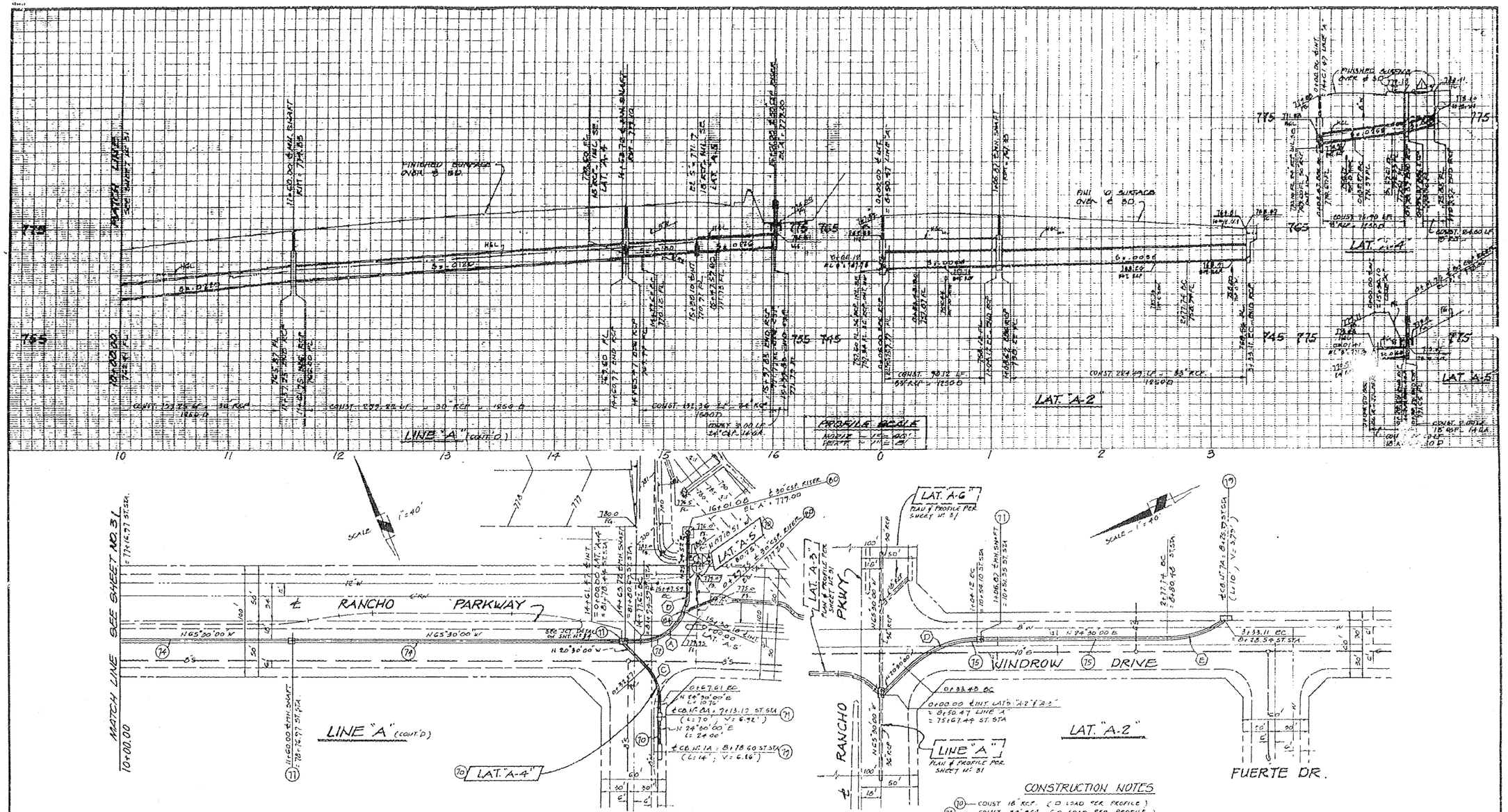


CONSTRUCTION NOTES

(70) — CONST 18" RCP. (D LOAD PER PROFILE)
(71) — CONST 24" RCP. (D LOAD PER PROFILE)
(74) — CONST 30" RCP. (D LOAD PER PROFILE)
(75) — CONST 33" RCP. (D LOAD PER PROFILE)
(77) — CONST JUNCTION STRUCTURE TYPE I PER OCEMA STD NO. 1310
(78) — CONST INLET TYPE I PER OCEMA STD NO. 1301
(79) — CONST INLET TYPE II (SIZE PER PLAN) PER OCEMA STD NO. 1302
(80) — CONST DROP INLET STRUCTURE PER DETAIL ON SHEET NO. 34
(83) — CONST JUNCTION STRUCTURE TYPE IV PER OCEMA STD NO. 1313

HYDRAULIC DATA

n = .015 FOR RCP

LINE	STATION TO STATION	Q	S_o	S_f	D_{10}	D_n	V_n	D_c	V_c
LINE "A"	10+00.00 — 11+57.25	135.9	.0220	.0077	30"	1.38	12.9	2.03	8.4
	11+61.75 — 14+60.97	135.9	.0120	.0077	30"	1.69	10.2	2.03	8.4
	14+65.47 — 15+30.10	123.3	.0150	.0106	24"	1.40	9.9	1.72	8.1
	15+30.10 — 15+77.83	15.9	.0126	.0049	24"	1.15	8.5	1.44	6.6
LAT. "A-2"	0+02.12 — 1+04.12	(22.8)	.0036	.0019	33"	1.73	5.8	1.58	6.5
	1+08.62 — 3+33.11	(22.8)	.0036	.0019	33"	1.73	5.8	1.58	6.5
LAT. "A-4"	0+02.47 — 0+78.37	12.7	.0265	.0146	18"	.96	10.6	1.34	7.6
	0+85.37 — 1+08.37	7.0	.0477	.0044	18"	.57	11.4	1.02	5.4
LAT. "A-5"	0+04.50 — 0+28.50	(7.6)	.0160	.0055	18"	.83	7.8	1.08	5.7

Q = 10 YR. <Q> = 100 YR.
(Q) = 25 YR. (Q) = MIN.

℄ RCP CURVE DATA

I.D.	REF.	Δ	R	L	T
(A)	LINE "A"	66°48'51"	45'	52.48'	29.68'
(B)	"	22°16'17"	45'	17.49'	8.86'
(C)		45°00'00"	45'	35.34'	18.64'
(D)	LAT. "A-2"	45°00'00"	90'	70.69	37.78
(E)	"	35°14'51"	90'	55.37	28.59

PROFESSIONAL ENGINEER ROBERT KALLENBAUGH 27987 STATE OF CALIFORNIA

Robert Bein, William Frost & Associates
PROFESSIONAL ENGINEERS, PLANNERS & SURVEYORS
P.O. BOX 19725 • 14725 ALTON PARKWAY • IRVINE, CALIFORNIA 92718
(714) 472-2503

S.R. Kallenbaugh — 6-14-89
S. ROBERT KALLENBAUGH R.C.E. 27987 DATE

DATE	BY	REV.	DESCRIPTION	APP'D	DATE
8-2-90	O.K.	1	REVISED TC ELEV FOR CB 12 BA ON LAT "A-4"		

REVISIONS

APPROVED
CITY ENGINEER
RCE NO.
DATE
FIELD BOOK | SCALE
DESIGNED P. Dale | DRAWN P. Dale
CHECKED B. Phillips | DATE

PLAN AND PROFILE FOR THE IMPROVEMENT OF STORM DRAIN
LINE "A"
FROM STA. 10+00.00 TO STA. 16+01.08
LAT. "A-2"
FROM STA. 0+00.00 TO STA. 3+33.11

TRACT NO. 13932

SHEET 32 OF 38

TR-IMP. 13932

Appendix G

Conceptual Water Quality Management Plan

CONCEPTUAL WATER QUALITY MANAGEMENT PLAN

Tentative Tract Map No. 17707

Permit No. GPA 12-13-3705; ZC 12-13-3706

Project Address:
28201 Rancho Parkway
Lake Forest, CA

Prepared for:
Baker Ranch Properties, LLC
1 Upper Newport Plaza
Newport Beach, CA 92660

Prepared by:

Hunsaker & Associates Irvine, Inc.
3 Hughes
Irvine, CA 92618
ATTN:
Ed Mandich
(949) 583-1010

WQMP Preparation Date:
February 26, 2014

WO. 2118-8

Conceptual Water Quality Management Plan (CWQMP)

TENTATIVE TRACT MAP NO. 17707

PERMIT NO. GPA 12-13-3705, ZC 12-13-3706

APN 104-143-46 & 104-143-47

28201 Rancho Parkway

Lake Forest, CA

Prepared for:

Baker Ranch Properties, LLC.

1 Upper Newport Plaza

Newport Beach, CA 92660

(949) 251-2045

Prepared by:

Hunsaker & Associates, Irvine, Inc.

3 Hughes

Irvine, CA 92618

(949) 583-1010

Contact: Ed Mandich

Prepared on:

February 26, 2014

Project Owner's Certification			
Permit/Application No.	GPA 12-13-3705 ZC 12-13-3706	Grading Permit No.	Project is in Entitlement Phase – Grading Permit No. to be provided with Final WQMP
Tract/Parcel Map No.	TTM 17707	Building Permit No.	Project is in Entitlement Phase – Building Permit No. to be provided with Final WQMP
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract)			APN 104-143-46 & -47

This Water Quality Management Plan (WQMP) has been prepared for Baker Ranch Properties by Hunsaker and Associates Irvine, Inc. The WQMP is intended to comply with the requirements of the local NPDES Stormwater Program requiring the preparation of the plan.

The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with the current Orange County Drainage Area Management Plan (DAMP) and the intent of the non-point source NPDES Permit for Waste Discharge Requirements for the County of Orange, Orange County Flood Control District and the incorporated Cities of Orange County within the Santa Ana Region and San Diego Region. Once the undersigned transfers its interest in the property, its successors-in-interest shall bear the aforementioned responsibility to implement and amend the WQMP. An appropriate number of approved and signed copies of this document shall be available on the subject site in perpetuity.

Owner: Larry Tucker			
Title	Co-Managing Member		
Company	Baker Ranch Properties		
Address	1 Upper Newport Plaza, Newport Beach, CA 92660		
Email			
Telephone #	(949) 251-2045		
Signature		Date	

Preparer (Engineer): Ed Mandich			
Title	Project Manager	PE Registration #	
Company	Hunsaker and Associates Irvine, Inc.		
Address	3 Hughes, Irvine, CA 92618		
Email	emandich@hunsaker.com		
Telephone #	(949) 583-1010		
I hereby certify that this Water Quality Management Plan is in compliance with, and meets the requirements set forth in, Order No. R8-2009-0030/NPDES No. CAS618030, of the Santa Ana Regional Water Quality Control Board**.**			
Preparer Signature		Date	
Place Stamp Here			

Contents

Page No.

Section I **Discretionary Permit(s) and Water Quality Conditions** 1

Section II **Project Description** 3

Section III **Site Description** 8

Section IV **Best Management Practices (BMPs)** 11

Section V **Inspection/Maintenance Responsibility for BMPs** 23

Section VI **Site Plan and Drainage Plan** 26

Section VII **Educational Materials** 38

Attachments

Attachment A ... . Educational Materials

Attachment B .... O & M Plan

Section I Discretionary Permit(s) and Water Quality Conditions

The project's discretionary permit and water quality information are provided in the following:

Project Infomation			
Permit/Application No.	GPA 12-13-3705 ZC 12-13-3706	Tract/Parcel Map No.	TTM No. 17707
Water Quality Conditions			
Water Quality Conditions (list verbatim)	The project is considered a priority project under Order No. R9-2009-0002, the City of Lake Forest Local Implementation Plan and Water Quality Ordinance (LFMC Chapter 15.14). Therefore, the project is subject to the requirements of a Water Quality Management Plan (WQMP) to minimize the adverse effects of urbanization on site hydrology, runoff flow rates and pollutant loads. Specific water quality conditions from the Conditions of Approval will be included in this WQMP once they have been provided.		
Watershed-Based Plan Conditions			
Provide applicable conditions from watershed - based plans including WIHMPs and TMDLS.	The eastern portion (majority) of the project site is located within the Aliso Creek Watershed and subject to the requirements of the South Orange County Hydromodification Management Plan and MS4 Permit. The western portion of the project site is located within the San Diego Creek Watershed (Serrano Creek) and subject to the requirements of North Orange County MS4 Permit. Currently, a WIHMP has not been approved for San Diego Creek. The project's southern receiving waters (Aliso Creek, Aliso Creek Mouth, Aliso Creek Mouth at Pacific Ocean).are listed as impaired on the 303(d) List for Indicator Bacteria. Per the SWRCB and EPA, TMDLs are currently "needed" but not yet established. The project's northern receiving waters discharges to San Diego Creek via Serrano Creek. Impairments for the project's receiving waters are as follows: Serrano Creek is currently 303(d) listed for Ammonia, Indicator Bacteria and pH. No TMDL's have been established. San Diego Creek Reach 2 is currently 303(d) listed for Indicator Bacteria, Nutrients, Sedimentation/Siltation and Unknown Toxicity. And has TMDLs for Metals, Nutrients, Sedimentation/Siltation and Unknown Toxicity. San Diego Creek Reach 1 is currently 303(d) listed for Pathogens, Nutrients, Pesticides, Sediment and Metals and has established TMDL's for Metals, Nutrients, Pesticides and Siltation.		

	Newport Bay (Upper and Lower) is currently 303(d) listed for Pesticides, Metals, Pathogens, Nutrients, Organics and Toxicity, with established TMDL's for Metals, Nutrients, Pathogens, Pesticides and Siltation.

Section II Project Description

II.1 Project Description

Description of Proposed Project		
Development Category (Verbatim from WQMP):	Priority Project, Category 1 – New development projects that create 10,000 square feet or more of impervious surface. This category includes commercial, industrial, residential housing subdivisions, mixed-use, and public projects on private or public property that falls under the planning and building authority or the Permittees.	
Project Area (ft^2): 1,308,335 ft^2, 30.035 ± acres (gross)	Number of Dwelling Units: 115 single family residential units and 1 mass graded lot for future medium density residential.	SIC Code: N/A. Project proposes residential units.
Narrative Project Description:	The proposed project, Tentative Tract Map No. 17707, encompasses approximately 30.0 acres within the City of Lake Forest. The site is bounded to the north by State Route 241, to the east by Portola Parkway, to the south by Rancho Parkway and to the west by an existing commercial business park. Proposed entrance into the site will be consistent with the existing entrance, via a single entrance off Rancho Parkway. Current address for the site is 28201 Rancho Parkway. The western portion of the proposed project site will include 115 detached single-family residences (low/medium density) with lot sizes ranging from 3525 square feet to 6303 square feet, private streets, parkway landscaping, recreation area, curb, sidewalk and gutter and storm drain improvements and related infrastructure improvements. The eastern portion of the site will consist of the project's proposed biofiltration BMP (Lot P), open space lot (Lot K) and a mass graded pad (Lot 117) for future medium density residential improvements by others (merchant builder). Parking will be provided via garage and un-covered surface parking. All dwelling units will have a two-car garage, with uncovered parking spaces provided in private driveways and project streets. Total parking shall be consistent with City of Lake Forest requirements. Designated open space/landscaping provided by the developer will consist of common areas located are throughout the project, which include open space lots, a recreation site, a basin site and parkway landscaping. In the ultimate condition, landscaping is anticipated to consists of approximately 37% of the project site (estimate includes private landscaping for LDR and MDR lot specific improvements).	

Description of Proposed Project

Site summary is as follows:

Lot	Use	Area (Ac)
1 – 61	Single Family Residential 47' x 75' Lots	5.5
62-112	Single-Family Residential 55' x 65' Lots	4.7
113	Entry Gate	0.1
114	Future Multi-Family (MDR)	9.7
115	Recreation Site	0.5
A – K	Open Space	2.0
L – O	Utility & Emergency Vehicle Access	0.2
P	Basin	1.8
Q, R & S	Private Streets	5.5
Total	--	30.0

Typical household wastes are anticipated to be generated daily from the residential portion of the project. Each residential unit will have trash bins located/stored within the private residence of each home. Trash will be collected on a weekly basis by the contracted local waste disposal company.

Project Area	Pervious		Impervious	
	Area (acres or sq ft)	Percentage	Area (acres or sq ft)	Percentage
Pre-Project Conditions	29.3	97.7	0.7	2.3
Post-Project Conditions	11.1	37	18.9	63

Drainage Patterns/Connections

In the natural condition, drainage from western portion of the site was conveyed westerly to Serrano Creek. Drainage from the remaining portion of the site was conveyed easterly to Aliso Creek. Due to the site's use for mining operations, drainage in the pre-development condition has been altered, with the entire site flowing southerly and southeasterly toward Rancho Parkway and conveyed via existing swales easterly toward Portola Parkway and then northerly to an existing basin.

Overflow from the basin is discharged to existing storm drain improvements located in Portola Parkway prior to discharging to Aliso Creek approximately 0.5 miles south of the project site.

II.2 Potential Stormwater Pollutants

Table 2.1, Anticipated and Potential Pollutants Generated by Land Use Type from the Technical Guidance Document (May 2011) lists the following Pollutants of Concern (POC's) associated with Residential Development (attached and detached): Suspended Solid/Sediments, Nutrients, Pathogens (Bacteria/Virus), Pesticides, Oil & Grease and Trash & Debris.

Pollutants of Concern			
Pollutant	E=Expected to be of concern N=Not Expected to be of concern		Additional Information and Comments
Suspended-Solid/ Sediment	E		Pollutant is a Primary POC. Potential sources of sediment include existing landscaping areas and disturbed earth surfaces.
Nutrients	E		Pollutant is Primary POC as downstream water is impaired for Nutrients. Potential sources of nutrients include fertilizers, sediment and trash/debris.
Heavy Metals		N	
Pathogens (Bacteria/Virus)	E		Pollutant is Primary POC. Potential sources of pathogens include pets, food wastes and landscaping/sediment areas.
Pesticides	E		Pollutant is a Primary POC. Potential sources of pesticides include landscaping and open space areas.
Oil and Grease	E		Potential source of oil and grease is parked vehicles.
Toxic Organic Compounds		N	
Trash and Debris	E		Potential sources include common litter and trash cans from residential homes.

II.3 Hydrologic Conditions of Concern

The purpose of this section is to identify any hydrologic conditions of concern (HCOC) with respect to downstream flooding, erosion potential of natural channels downstream, impacts of increased flows on natural habitat, etc. As specified in Section 2.3.3 of the 2011 Model WQMP, projects must identify and mitigate any HCOCs. A HCOC is a combination of upland hydrologic conditions and stream biological and physical conditions that presents a condition of concern for physical and/or biological degradation of streams.

Per the South Orange County Hydromodification Management Plan (SOCHMP), HCOCs are considered to exist if any streams located downstream from the project are determined to be potentially susceptible to hydromodification impacts. Additionally, post-project runoff discharge rates and durations for projects shall not exceed pre-development, naturally occurring, runoff flow rates and durations by more than 10% of the time, from 10% of the 2-year runoff event up to the 10-year runoff event.

Per the North Orange County WQMP TGD, HCOCs are considered to exist if the volume for the 2-year runoff event for post-development condition exceeds pre-development condition by more than 5% or the time of concentration is less than the pre-development condition by greater than 5%.

Is the proposed project potentially susceptible to hydromodification impacts?

☒ Yes ☐ No

The proposed project will increase the amount of impervious area located within the project site, thereby increasing runoff volume and rate. Therefore, the project is subject to the hydromodification requirements set forth in the SOCHMP as well as the hydromodification requirements prescribed in the TGD for North Orange County.

Based on the approved WQMP prepared for Rancho Parkway improvements[1] to the south of the project site, which provided hydromodification analysis for both Rancho Parkway extension and TTM 17707, the hydromodification volume that needs to be mitigated is 223,620 ft^3. The proposed basin located at the northeast portion of the project site has been designed to accommodate this volume.

The existing storm drain line located in Rancho Parkway (southwest of the project site) was designed according to the natural tributary area, which includes approximately 4-acres of the western portion of the project site. Based on the information provided from the storm drain plan and study for Rancho Parkway improvements, the 2-year runoff for the pre-development condition is 9.0 cfs (for approximately 4 acres onsite). The 2-year runoff for the project condition has been determined to be approximately 4.3 cfs (for approximately 2.91 acres).

[1] Psomas. December 8, 2011. *WQMP for Rancho Parkway from Hermana Circle to Portola Parkway. City of Lake Forest, CA.*

II.4 Post Development Drainage Characteristics

Describe post development drainage characteristics.

In the developed condition, runoff from the small western portion of the site (approximately 2.91 acres) will be drain as sheet flow from project lots to street gutters and conveyed southerly to a proposed catch basin prior to discharging to the existing Rancho Parkway storm drain system. Runoff is then conveyed westerly to Serrano Creek and southerly to Reach 2 of San Diego Creek.

Runoff from the eastern portion of the developed site will be conveyed as sheet flow from project lots to street gutters prior to discharging to project catch basins and the storm drain system. Runoff is then conveyed to a bioretention (biofiltration)/detention basin located at the northeastern portion of the site. Runoff entering the basin is eventually discharged to the existing storm drain system located in Portola Parkway and conveyed approximately 0.5 miles south to Aliso Creek.

The proposed bioretention basin and proprietary biotreatment facilities are intended to satisfy the project's requirements for Low Impact Development (LID) and storm water treatment. Water quality flows (non-storm water flows and the Design Capture Volume) from the project's onsite drainage areas will be conveyed to either of the BMPs for treatment. Additionally, where feasible, depressed landscaping areas (approximately 1-2" in depth) in the project's parkways will be used to retain a small portion of the DCV. It is anticipated that the main mechanisms for removal of the small amount of collected runoff will be soil storage, infiltration and evapotranspiration.

II.5 Property Ownership/Management

The property owner, Baker Ranch Properties, shall assume all BMP maintenance and inspection responsibilities until the establishment of a Homeowners Association. Inspection and maintenance activities are in Section V of this CWQMP.

Section III Site Description

III.1 Physical Setting

General descriptions of the project area are provided below:

Planning Area/ Community Name	Planning Area – Baker Ranch Planned Community Community Name – Tentative Tract Map No. 17707
Location/Address	Northwest of Portola Parkway and Rancho Parkway 28201 Rancho Parkway, Lake Forest, California
Project Area Description	The site is bound to the north by SR-241, to the east by Portola Parkway, to the south by Rancho Parkway and to the west by an existing commercial development. The project site was historically used for sand mining operations. In general, the site slopes in a southeasterly direction toward a constructed berm that parallels Rancho Parkway to the south and Portola Parkway to the east. Currently, the site is used to support a nursery as well as a materials storage yard for various operations.
Land Use	Existing: Commercial with Mineral Resources and Public Facilities Overlay Proposed: Multi-Family Residential
Zoning	Existing: UA/SG/C – Urban Activity/Sand & Gravel/Commercial Proposed: LDR/MDR – Low Density Residential/Medium Density Residential
Acreage	30.0 Acres
Predominant Soil Type	Predominant soil type onsite is Hydrologic Soil Type D.

III.2 Site Characteristics

The following table summarizes general characteristics of the project site:

Precipitation Zone	0.95 in.
Topography	The pre-development site is relatively flat and drains in a southeasterly direction.
Drainage Patterns/Connections	In general, runoff from the site is conveyed southeasterly as sheet flow to an existing swale located at the southern portion of the site. Runoff is then conveyed towards Portola Parkway and northerly to a basin located at the northeastern portion of the property.
Soil Type, Geology, and Infiltration Properties	Based on information from the Natural Resource Conservation Service Web Soil Survey, onsite soils consist primarily of Cieneba Sandy Loam, which is rated as a Hydrologic Group D Soil, characterized as having very slow infiltration rates when thoroughly wet; followed by Myford Loam, also a Group D soil, in the northeastern portion of the site. Geologically, the site is located within the foothills of the Santa Ana Mountains, part of the Peninsular Ranges Geomorphic Province. The region consists of dissected foothills bordering the Los Angeles Basin to the northwest and the granite-core Santa Ana Mountains to the east. The Southern California Batholith forms the core of the Santa Ana Mountains, which is overlain by a thick sequence of sedimentary units, which comprise the foothills. The foothills have been tilted, folded, and faulted since deposition as a result of regional uplift. Drainage from the nearby mountains has dissected the subject area and the alluvial deposits within the subject region are ultimately connected to alluvium of the Tustin Plain to the southwest of the site. Late Miocene to Early Pliocene bedrock materials of the Capistrano Formation that underlie the subject site are primarily composed of sandstone and silty sandstone.
Hydrogeologic (Groundwater) Conditions	No groundwater was encountered in geotechnical borings conducted at the northern portion of the site to 21 feet below existing grade. However, soil borings conducted as part of the Rancho Parkway Extension project to the south encountered groundwater at 24 feet below existing grade. Therefore, groundwater is anticipated at approximately 24 feet below existing grade.
Geotechnical Conditions (relevant to infiltration)	Based on the TGD and NRCS data, underlying soils consists primarily of Group “D” soils, which are not favorable for infiltration.
Off-Site Drainage	The project does not receive offsite run-on from adjacent properties.
Utility and Infrastructure Information	Wet and dry utilities are proposed for this tract and will connect to existing facilities located along Rancho Parkway.

III.3 Watershed Description

The following table includes descriptions of the project's receiving waters:

Receiving Waters	Santa Ana RWQCB: Serrano Creek, San Diego Creek (Reach 2), San Diego Creek (Reach 1), Upper and Lower Newport Bay. San Diego RWQCB: Aliso Creek, Aliso Creek (Mouth), Pacific Ocean at Aliso Creek (Mouth)
303(d) Listed Impairments	*Santa Ana RWQCB:* Serrano Creek – Ammonia, Indicator Bacteria, pH San Diego Creek (Reach 2) – Indicator Bacteria, Nutrients, Sedimentation/Siltation, Unknown Toxicity San Diego Creek (Reach 1) – Fecal Coliform, Selenium, Toxaphene, Nutrients, Pesticides, Sedimentation/Siltation Newport Bay (Upper) – Chlordane, Copper, DDT, Indicator Bacteria, Metals, Nutrients, PCBs, Pesticides, Sediment Toxicity, Sedimentation Siltation Newport Bay (Lower) – Chlordane, Copper, DDT, Indicator Bacteria, Nutrients, PCBs, Pesticides, Sediment Toxicity *San Diego RWQCB:* Aliso Creek – Pathogens (Indicator Bacteria), Nutrients (Phosphorus, Total Nitrogen), Metals (Selenium), Toxicity Aliso Creek (Mouth) – Pathogens (Indicator Bacteria) Pacific Ocean at Aliso Creek (Mouth) – Pathogens (Enterococcus, Total Coliform, Fecal Coliform)
Applicable TMDLs	San Diego Creek (Reach 2) – Nutrients, Sedimentation/Siltation, Unknown Toxicity, Metals San Diego Creek (Reach 1) – Indicator Bacteria, Nutrients, Pesticides, Sedimentation/Siltation, Metals Newport Bay (Upper) – Indicator Bacteria, Nutrients, Pesticides, Sedimentation/Siltation, Metals, Siltation Newport Bay (Lower) – Indicator Bacteria, Nutrients, Pesticides, Metals, Siltation
Pollutants of Concern for the Project	Pollutants of Concern for the project include: Suspended Solids/Sediment, Nutrients, Pathogens, Pesticides, Oil & Grease, Trash & Debris. Primary Pollutants of Concern for the project include: Nutrients, Pesticides and Pathogens.
Environmentally Sensitive and Special Biological Significant Areas	Serrano Creek, San Diego Creek, Newport Bay, Aliso Creek, Aliso Creek Mouth and the Pacific Ocean at Aliso Creek Mouth are all listed as impaired water bodies and are therefore, designated as ESA's per the OC DAMP. There are no Areas of Special Biological Significance (ASBS) or ESA's within the project site.

Section IV Best Management Practices (BMPs)

IV. 1 Project Performance Criteria

Project Performance Criteria			
(NOC Permit Area only) Is there an approved WIHMP or equivalent for the project area that includes more stringent LID feasibility criteria or if there are opportunities identified for implementing LID on regional or sub-regional basis?	YES ☐	NO ☒	N/A ☐
If yes, describe WIHMP feasibility criteria or regional/sub-regional LID opportunities.	The WIHMP for San Diego Creek Watershed has been submitted to the RWQCB and is awaiting approval. Project drainage located within SOC Permit Area shall be subject to the requirements of the SOCHMP		
If HCOC exists, list applicable hydromodification control performance criteria	NOC: Post-project runoff discharge volume for the 2-year frequency storm does not exceed that of the predevelopment condition by more than 5% and time of concentration of post-development runoff for the 2-year storm event is not less than that for the predevelopment condition by more than 5%. SOC: Post-project runoff discharge rates and durations for projects shall not exceed pre-development, naturally occurring, runoff flow rates and durations by more than 10% of the time, from 10% of the 2-year runoff event up to the 10-year runoff event.		
List applicable LID performance criteria	LID BMPs for the project proposes to meet the following LID performance criteria: • Biotreat the remaining DCV onsite to the MEP.		
List applicable treatment control BMP performance criteria	Project proposes the use of LID BMPs to address the project's design capture volume.		

Calculate LID design storm capture volume for Project.	DCV = C x D x A x 43560 sf/ac x 1/12 ft/in Where: DCV = design storm capture volume, cu-ft C = runoff coefficient = (0.75 x imp + 0.15) Imp = impervious fraction of drainage area (ranges from 0 to 1) D = storm depth (inches) A = tributary area (acres) *Imp = 0.60 (Western); 0.60 (Central); 0.75 (Eastern)* *D = 0.95 inches* *A = 2.91 (Western); 14.75 (Central); 11.15 (Eastern)* *DCV (western) = 0.60 x 0.95 x 2.91 ac x 43560 sf/ac x 1/12 ft/in = 6,021.1 ft^3* *DCV (Central) = 0.60 x 0.95 x 14.75 ac x 43560 sf/ac x 1/12 ft/in = 30,519.3 ft^3* *DCV (Eastern) = 0.7125 x 0.95 x 11.15 ac x 43560 sf/ac x 1/12 ft/in = 27,396.2 ft^3* **DCV Total[1] = 64,116.6 ft^3**

[1]DCV total shown based on DMA limits and not property boundary.

IV.2. SITE DESIGN AND DRAINAGE PLAN

The primary goal of site design principles and techniques is to reduce land development impacts on water quality and downstream hydrologic conditions. Benefits of site design include reductions in the size of downstream BMPs, conveyance systems, pollutant loading and hydromodification impacts.

IV.2.1 Site Design BMPs

The following section describes the site design BMPs that have been incorporated into this project.

Minimize Impervious Area

Landscaping will be provided throughout the site, along project streets, within private lots as well as common lettered lots and recreation lot.

Maximize Natural Infiltration Capacity

Project consists of Type D soils, which is not favorable for infiltration. However, the project will utilize some retention of runoff in the project's landscaping areas to allow for some infiltration and evapotranspiration processes. These areas include parkway landscaping areas that will be designed as depressed areas (lower than adjacent paved areas), which will retain small amounts of runoff.

Preserve Existing Drainage Patterns and Time of Concentration

In general, the proposed drainage pattern is consistent with existing drainage patterns as all runoff is collected and discharged to the basin located in the northeastern portion of the project site. The time of concentration for the natural/pre-project conditions will be preserved per the project's Hydromodification Management Plan.

Disconnect Impervious Areas

Landscaping will be provided adjacent to sidewalks, within common lot areas, as well as open areas between unit complexes (MDR site) to break up the project's impervious areas.

Protect Existing Vegetation and Sensitive Areas, and Revegetate Disturbed Areas

The site has minimal estblasiehd vegetation in the pre-project condition. There are no natural areas or critical landscaping areas to preserve. All disturbed areas will either be paved or landscaped.

Xeriscape Landscaping

Native and/or tolerant landscaping will be incorporated into the site design consistent with City guidelines.

IV.3 LID BMP SELECTION AND PROJECT CONFORMANCE ANALYSIS

Per the 4th Term MS4 Storm Water Permits for the San Diego and Santa Ana Regions (Order No. R9-2009-0002 and Order No. R8-2009-030), Low Impact Development (LID) BMPs must be incorporated into design features and source controls to reduce project related storm water pollutants. The incorporation of LID BMPs into project design requires evaluation of LID measures

in the following treatment hierarchy: infiltration, evapotranspiration, harvest/reuse and biotreatment.

The project proposes the use of Hydrologic Source Controls and Biotreatment LID BMPs to address pollutants from the project's runoff.

IV.3.1 Hydrologic Source Controls (HSCs)

Hydrologic source controls (HSCs) can be considered to be an integration of site design practices and LID BMPs. The goal of HSCs is to reduce runoff volume for a given drainage area without reducing the site's true impervious area.

Name	Included?
Localized on-lot infiltration	☒
Impervious area dispersion (e.g. roof top disconnection)	☒
Street trees (canopy interception)	☐
Residential rain barrels (not actively managed)	☐
Green roofs/Brown roofs	☐
Blue roofs	☐
Impervious area reduction (e.g. permeable pavers, site design)	☐

The following HSCs have been selected for use on this project:

HSC-1 Localized On-Lot Infiltration

A portion of the runoff from the common parkway area sidewalks will be conveyed to the adjacent parkway landscaping area for retention. The landscaping area will be depressed (approximately 2" lower than surrounding areas) and allow storage of a portion of the project's DCV for evapotranspiration and some infiltration. The locations of the parkway landscaping areas have yet to be determined in the tentative map phase of the project. The WQMP Site Plan provided in Section VI provides the approximate locations of these areas. Once the locations have been determined, the portion of the DCV captured by the depressed areas can be calculated. Until such time, the proposed bioretention BMPs shall be designed to capture and treat the full DCV for its tributary drainage areas.

HSC-1 SUMMARY						
HSC ID	**% Impervious**	**Storm Depth (D)**	**Drainage Area (ac)**	**Runoff Coefficient (C)**	**DCV (ft^3)**	**Footprint (ft^2)**
HSC XX	TBD	0.95	TBD	TBD	TBD	TBD

HSC-2 Impervious Area Dispersion

Where feasible, runoff from roofs and paved surfaces will be directed towards landscape areas to allow for filtration, evapotranspiration and some infiltration of runoff and volume reduction. Since the majority of these areas will be dependent on lot-specific improvements, they will be addressed further once the architectural design of the proposed housing units are available. Once the locations have been determined, the portion of the DCV captured by landscaped areas can be calculated. Until such time, the proposed bioretention BMPs shall be designed to capture and treat the full DCV for its tributary drainage areas.

HSC-2 SUMMARY						
HSC ID	**% Impervious**	**Storm Depth (D)**	**Drainage Area (ac)**	**Runoff Coefficient (C)**	**DCV (ft^3)**	**Footprint (ft^2)**
HSC XX	TBD	0.95	TBD	TBD	TBD	TBD

HSC-3 Street Trees

Trees will be planted along the project's parkways and within common lot areas to intercept rainfall and provide some volume reduction benefits for the project.

IV.3.2 Infiltration BMPs

Infiltration BMPs are LID BMPs that capture, store and infiltrate storm water runoff. These BMPs are engineered to store a specified volume of water and have no design surface discharge (underdrain or outlet structure) until this volume is exceeded. Examples of infiltration BMPs include infiltration trenches, bioretention without underdrains, drywells, permeable pavement, and underground infiltration galleries.

Name	Included?
Bioretention without underdrains	☐
Rain gardens	☐
Porous landscaping	☐
Infiltration planters	☐
Retention swales	☐
Infiltration trenches	☐
Infiltration basins	☐
Drywells	☐
Subsurface infiltration galleries	☐
French drains	☐
Permeable asphalt	☐
Permeable concrete	☐
Permeable concrete pavers	☐

Due to the project's unfavorable soil type (Hydrologic Soil Group D), BMPs that employ infiltration as the primary mechanism for pollutant removal have not been proposed.

IV.3.3 Evapotranspiration, Rainwater Harvesting BMPs

Name	Included?
EVAPOTRANSPIRATION	
All HSCs; *See Section IV.3.1*	☐
Surface-based infiltration BMPs	☐
Biotreatment BMPs	☒
HARVEST & REUSE/ RAINWATER HARVESTING	
Above-ground cisterns and basins	☐
Underground detention	☐

Evapotranspiration

Evapotranspiration BMPs are a class of retention BMPs that discharges stored volume predominately to ET, through some infiltration may occur. ET includes both evaporation and transpiration, and ET BMPs may incorporate one or more of these processes. BMPs must be designed to achieve the maximum feasible ET, where required to demonstrate that the maximum amount of water has been retained on-site. Since ET is not the sole process in the proposed BMPs, specific design and sizing criteria have not been developed for ET-based BMPs.

Harvest and Reuse

Harvest and Reuse (aka. Rainwater Harvesting) BMPs are LID BMPs that capture and store storm water runoff for later use. These BMPs are engineered to store a specified volume of water and have no design surface discharge until this volume is exceeded. Harvest and use BMPs include both above-ground and below-ground cisterns. Examples of uses for harvested water include irrigation, toilet and urinal flushing, vehicle washing, evaporative cooling, industrial processes and other non-potable uses.

The project does not propose the use of harvesting BMPs, as there is insufficient demand and oversight for captured water use in private residential homes. Additionally, the project would have reclaimed water sources available for irrigation use (TGD X.2.8).

IV.3.4 Biotreatment BMPs

Biotreatment BMPs are a class of structural LID BMPs that treat suspended solids and dissolved pollutants in storm water using mechanisms characteristic of biologically active systems. These BMPs are considered treat and release facilities and include treatment mechanisms that employ soil microbes and plants. Additional benefits of these BMPs may include aesthetic enjoyment, recreational use, wildlife habitat and reduction in storm water volume.

Due to the project site's unfavorable soil condition for implementing infiltration based BMPs, biotreatment BMPs have been selected to address project-specific pollutants of concern present in runoff prior to discharging offsite.

BIOTREATMENT		
ID	Name	Included?
BIO-1	Bioretention with underdrains	☒
	Stormwater planter boxes with underdrains	☐
	Rain gardens with underdrains	☐
BIO-5	Constructed wetlands	☐
BIO-2	Vegetated swales	☐
BIO-3	Vegetated filter strips	☐
BIO-7	Proprietary vegetated biotreatment systems	☒
BIO-4	Wet extended detention basin	☐
BIO-6	Dry extended detention basins	☐

In general, runoff from the project site will be conveyed via the project's storm drain system northeasterly to a proposed bioretention (biofiltration) basin located in the northeastern portion of the project site. In addition to addressing runoff pollutants, the basin has also been designed to meet the project's hydromodification and hydrology requirements.

BMP Sizing – Volume Based BMP

BIORETENTION (BIOFILTRATION) BASIN BMP SUMMARY						
Drainage Management Area	**% Impervious**	**Design Storm Capture Depth (in)**	**Drainage Area (ac)**	**Runoff Coefficient (C)**	**DCV Simple (ft^3)**	**DCV Constant Drawdown (ft^3)**
DMA 1A[1]	60	0.95	14.75	0.60	30,519.3	13,733.7
DMA 1B	75	0.95	11.15	0.7125	27,396.2	12,382.3

[1] DCV to be revised once volume reduced from upstream HSC can be determined.

BMP Sizing – Flow Based BMP

BIORETENTION (BIOFILTRATION) BASIN BMP SUMMARY						
Drainage Management Area	**% Impervious**	**Design Storm Capture Depth (in)**	**Drainage Area (ac)**	**Runoff Coefficient (C)**	**DCV Simple (ft^3)**	**Q_{BMP} (cfs)**
DMA 2[1]	60	0.95	2.91	0.60	6,021.1	0.472

[1] DCV to be revised once volume reduced from upstream HSC can be determined.

IV.3.5 Hydromodification Control BMPs

The eastern portion of the project site is subject to the hydromodification requirements of the SOCHMP. The proposed basin will be employed to address the project's DCV and mitigate for hydromodification/hydrological impacts.

IV.3.6 Regional/Sub-Regional LID BMPs

Not applicable. Treatment of projects DCV will be addressed onsite.

IV.3.7 Treatment Control BMPs

Not applicable. Project proposes the use of LID BMPs to address potential pollutants present in the project's runoff.

IV.3.8 Non-structural Source Control BMPs

The Table below indicates all Non-Structural Source Control BMPs to be utilized in the project. Discussions of the selected BMPs are provided in the BMP Inspection and Maintenance Responsibility Matrix provided in Section V of this WQMP.

Non-Structural Source Control BMPs				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
N1	Education for Property Owners, Tenants and Occupants	☒	☐	
N2	Activity Restrictions	☒	☐	
N3	Common Area Landscape Management	☒	☐	
N4	BMP Maintenance	☒	☐	
N5	Title 22 CCR Compliance (How development will comply)	☐	☒	Proposed facility will not generate waste subject to Title 22 CCR compliance.
N6	Local Industrial Permit Compliance	☐	☒	Not applicable to residential developments or parks.
N7	Spill Contingency Plan	☐	☒	Proposed facilities will not generate waste or store materials subject to the requirements of Chapter 6.95 of the CA Health and Safety Code.
N8	Underground Storage Tank Compliance	☐	☒	None proposed.
N9	Hazardous Materials Disclosure Compliance	☐	☒	Proposed project will not store or generate hazardous materials subject to agency requirements.
N10	Uniform Fire Code Implementation	☐	☒	Proposed facility does not propose to store toxic or highly toxic compressed gases.

Non-Structural Source Control BMPs				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
N11	Common Area Litter Control	☒	☐	
N12	Employee Training	☐	☒	Proposed project is residential.
N13	Housekeeping of Loading Docks	☐	☒	No loading docks proposed.
N14	Common Area Catch Basin Inspection	☒	☐	
N15	Street Sweeping Private Streets and Parking Lots	☒	☐	
N16	Retail Gasoline Outlets	☐	☒	Project is for residential community development only.

IV.3.9 Structural Source Control BMPs

The Table below indicates all Structural Source Control BMPs to be utilized in the project. Discussions of the selected BMPs are provided in the BMP Inspection and Maintenance Responsibility Matrix provided in Section V of this WQMP.

Structural Source Control BMPs				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
S1	Provide storm drain system stenciling and signage	☒	☐	
S2	Design and construct outdoor material storage areas to reduce pollution introduction	☐	☒	No outdoor material storage areas proposed for project use.
S3	Design and construct trash and waste storage areas to reduce pollution introduction	☐	☒	No designated common trash area proposed.
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	☒	☐	
S5	Protect slopes and channels and provide energy dissipation	☒	☐	
	Incorporate requirements applicable to individual priority project categories (from SDRWQCB NPDES Permit)	☒	☐	
S6	Dock areas	☐	☒	None proposed.
S7	Maintenance bays	☐	☒	None proposed.
S8	Vehicle wash areas	☐	☒	None proposed.
S9	Outdoor processing areas	☐	☒	None proposed.
S10	Equipment wash areas	☐	☒	None proposed.
S11	Fueling areas	☐	☒	None proposed.
S12	Hillside landscaping	☐	☒	None proposed
S13	Wash water control for food preparation areas	☐	☒	None proposed.
S14	Community car wash racks	☐	☒	None proposed.

A discussion of each selected source control BMP is provided in Section V of this WQMP.

IV.4 ALTERNATIVE COMPLIANCE PLAN (IF APPLICABLE)

IV.4.1 Water Quality Credits

The proposed project is able to meet LID compliance via the employment of onsite LID practices. Therefore, water quality credits do not apply to this project.

Description of Proposed Project				
Project Types that Qualify for Water Quality Credits (Select all that apply):				
☐ Redevelopment projects that reduce the overall impervious footprint of the project site.	☐ Brownfield redevelopment, meaning redevelopment, expansion, or reuse of real property which may be complicated by the presence or potential presence of hazardous substances, pollutants or contaminants, and which have the potential to contribute to adverse ground or surface WQ if not redeveloped.		☐ Higher density development projects which include two distinct categories (credits can only be taken for one category): those with more than seven units per acre of development (lower credit allowance); vertical density developments, for example, those with a Floor to Area Ratio (FAR) of 2 or those having more than 18 units per acre (greater credit allowance).	
☐ Mixed use development, such as a combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that can demonstrate environmental benefits that would not be realized through single use projects (e.g. reduced vehicle trip traffic with the potential to reduce sources of water or air pollution).		☐ Transit-oriented developments, such as a mixed use residential or commercial area designed to maximize access to public transportation; similar to above criterion, but where the development center is within one half mile of a mass transit center (e.g. bus, rail, light rail or commuter train station). Such projects would not be able to take credit for both categories, but may have greater credit assigned		☐ Redevelopment projects in an established historic district, historic preservation area, or similar significant city area including core City Center areas (to be defined through mapping).
☐ Developments with dedication of undeveloped portions to parks, preservation areas and other pervious uses.	☐ Developments in a city center area.	☐ Developments in historic districts or historic preservation areas.	☐ Live-work developments, a variety of developments designed to support residential and vocational needs together – similar to criteria to mixed use development; would not be able to take credit for both categories.	☐ In-fill projects, the conversion of empty lots and other underused spaces into more beneficially used spaces, such as residential or commercial areas.
Calculation of Water Quality Credits (if applicable)	Not Applicable.			

IV.4.2 Alternative Compliance Plan Information

Not applicable. The project is able to meet LID BMP requirements onsite to address pollutants in project related storm water runoff.

Section V Inspection/Maintenance Responsibility for BMPs

Refer to the BMP inspection and maintenance responsibility matrix below. Inspection and maintenance records must be kept for a minimum of five years for inspection by the regulatory agencies.

BMP INSPECTION & MAINTENANCE RESPONSIBILITIES MATRIX				
BMP		**Inspection/ Maintenance Activities Required**	**Minimum Frequency**	**Reponsible Party(s)**
HYDROLOGIC SOURCE CONTROL BMPs				
HSC-1	On-Lot Infiltration	Inspect for standing water and that water evaporates, transpires or infiltrates into underlying soil completely. Remove accumulated sediment as needed.	After significant storm events, with weekly landscape maintenance and annually	Owner/HOA
HSC-2	Impervious Area Dispersion	Inspect for standing water and that water evaporates, transpires or infiltrates into underlying soil completely. Remove accumulated sediment as needed.	After significant storm events, with weekly landscape maintenance and annually	Owner/HOA
BIO-TREATMENT BMPs				
BIO-1	Bioretention with Underdrains (Biofiltration Basin)	Inspect with landscaping maintenance activities for weed growth, mulch depth, standing water, visible signs of erosion and vegetation health. Repair/replace as needed.	Weekly with landscaping maintenance activities	Owner/HOA
BIO-7	Proprietary Biotreatment (Katchall, Filterra, MWS or approved equivalent)	Inspect prior to the rainy season and after significant storm events. Clean out and/or replace mulch/media per manufacturer's recommendations	Annual and after significant storm events	Owner/HOA
NON-STRUCTURAL SOURCE CONTROL BMPs				
N1	Education for Property Owners, Tenants and Occupants	Educational materials will be provided to homeowners at close of escrow by the developer and thereafter on an annual basis by the HOA. Materials shall include those provided in Attachment A of this WQMP and any updated materials.	Annually	Owner/HOA

BMP INSPECTION & MAINTENANCE RESPONSIBILITIES MATRIX				
BMP		**Inspection/ Maintenance Activities Required**	**Minimum Frequency**	**Reponsible Party(s)**
N2	Activity Restrictions	The Owner will prescribe activity restrictions to protect surface water quality, through a Covenant, Conditions and Restrictions (CC&Rs) agreement, or other equally effective measure, for the property. Upon takeover of site responsibilities by the Homeowners Association (HOA), the HOA shall be responsible for ensuring residents compliance.	Ongoing	Owner/HOA
N3	Common Area Landscape Management	Maintenance shall be consistent with City requirements, plus fertilizer and/or pesticide usages shall be consistent with County guidelines for use of fertilizers and pesticides (OC DAMP Section 5.5). Maintenance includes mowing, weeding, and debris removal on a weekly basis. Trimming, replanting and replacement of mulch shall be performed on an as-needed basis. Trimmings, clippings, and other waste shall be properly disposed of off-site in accordance with local regulations. Materials temporarily stockpiled during maintenance activities shall be placed away from water courses and drain inlets.	Weekly	Owner/HOA
N4	BMP Maintenance	Maintenance of BMPs implemented at the project site shall be performed at the frequency prescribed in this WQMP. Records of inspections and BMP maintenance shall be maintained by the responsible party and documented with the WQMP, and shall be available for review upon request.	Ongoing	Owner/HOA
N11	Common Area Litter control	Litter patrol, violations investigation, reporting and other litter control activities shall be performed in conjunction with maintenance activities. Littler collection and removal shall be performed on a weekly basis.	Weekly	Owner/HOA

BMP INSPECTION & MAINTENANCE RESPONSIBILITIES MATRIX				
BMP		**Inspection/ Maintenance Activities Required**	**Minimum Frequency**	**Reponsible Party(s)**
N14	Common Area Catch Basin Inspection	Catch basin inlets, area drains, swales, curb-and-gutter systems and other drainage systems shall be inspected prior to October 1st of each year and after large storm events. If necessary, drains shall be cleaned prior to any succeeding rain events.	Annually	Owner/HOA
N15	Street Sweeping Private Streets	Streets shall be swept at minimum prior to the storm season, in late summer or early fall.	Annually	Owner/HOA
STRUCTURAL SOURCE CONTROL BMPs				
S1 SD-13	Provide storm drain system stencilling and signage	Storm drain stencils shall be inspected for legibility, at minimum, once prior to the storm season, no later than October 1st each year. Those determined to be illegible will be re-stenciled as soon as possible.	Annually	Owner/HOA
S4 SD-10; SD-12	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	In conjunction with routine maintenance activities, verify that landscape design continues to function properly by adjusting properly to eliminate overspray to hardscape areas, and to verify that irrigation timing and cycle lengths are adjusted in accordance with water demands, given time of year, weather, day or night time temperatures based on system specifications and local climate patterns.	Monthly	Owner/HOA
S5	Protect slopes and channels and provide energy dissipation	Inspect slopes for signs of erosion and repair as soon as possible. Inspect for vegetation health and cover and replace/replant as needed. Inspect rip rap (in basin) for signs of erosion. Repair as needed.	Monthly	Owner/HOA

Section VI Site Plan and Drainage Plan

The exhibits provided in this section are to illustrate the post construction BMPs prescribed within this WQMP. Drainage flow information of the proposed project, such as general surface flow lines, concrete or other surface drainage conveyances, and storm drain facilities are also depicted. All structural source control and treatment control BMPs are shown as well.

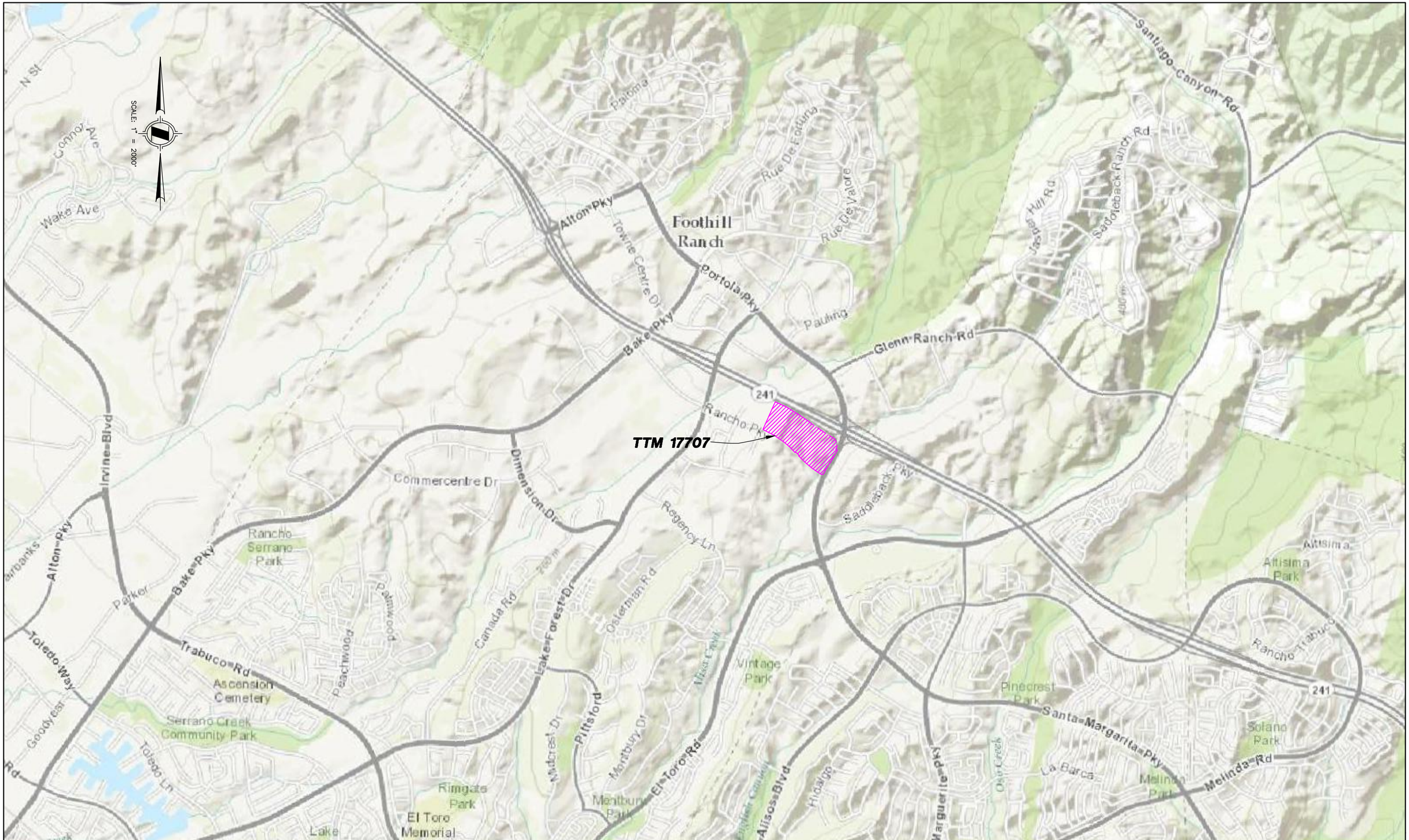
Exhibits

- Vicinity Map
- Conceptual WQMP Site Plan

BMP Details

- HSC-1 On-Lot Infiltration
- HSC-2 Impervious Area Dispersion
- BIO-1 Bioretention with Underdrains
- BIO-7 Proprietary Biotreatment

Vicinity Map, Conceptual WQMP Site Plan, BMP Calculations & Details



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TENTATIVE TRACT MAP NO. 17707
28201 RANCHO PARKWAY
CITY OF LAKE FOREST
COUNTY OF ORANGE, CA

CONCEPTUAL WQMP VICINITY MAP

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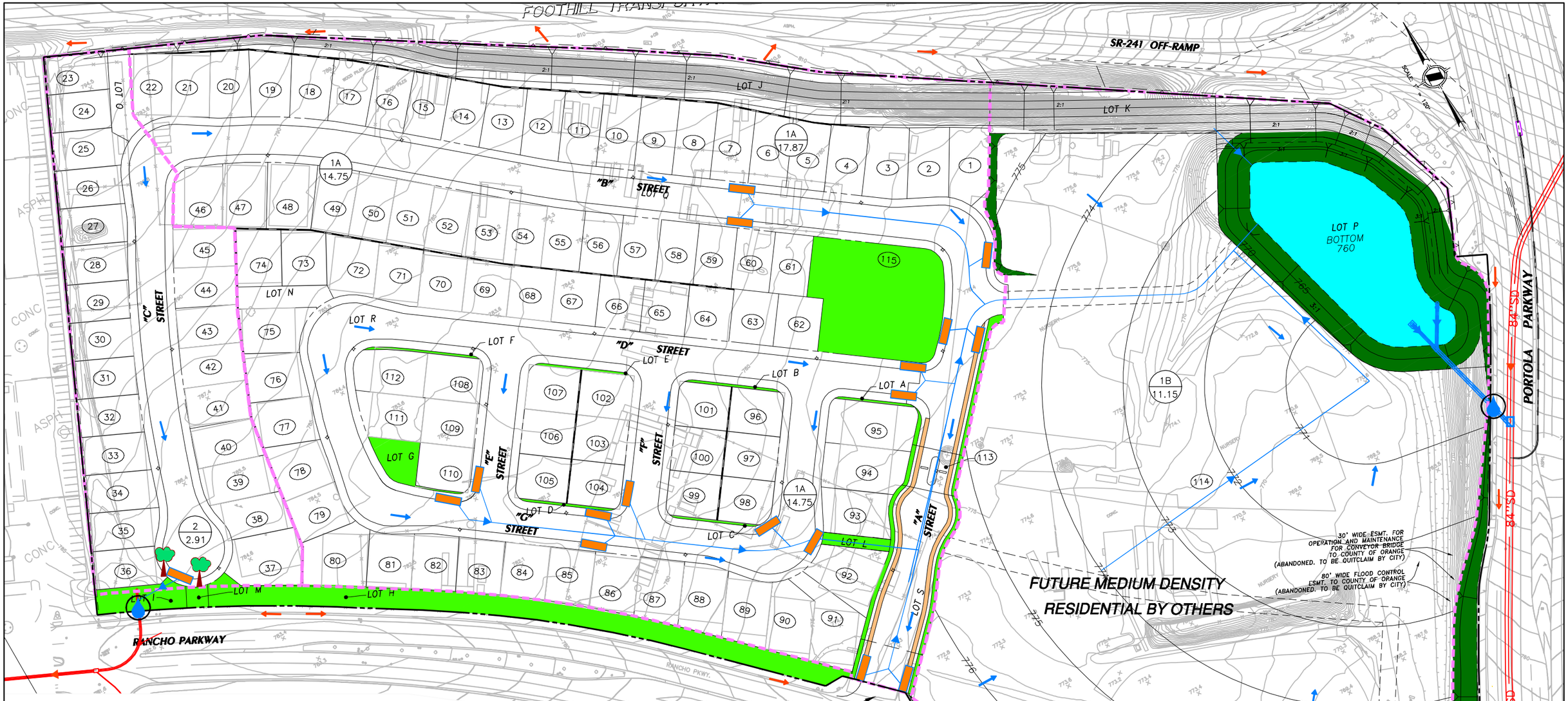

LEGEND

- TRACT BOUNDARY
- DRAINAGE MANAGEMENT AREA (DMA) BOUNDARY
- NAP — NOT A PART
- DIRECTION OF PROJECT SURFACE FLOW (ONSITE)
- DIRECTION OF SURFACE FLOW (OFFSITE)
- PROPOSED PRIVATE STORM DRAIN AND FLOW
- EXISTING STORM DRAIN AND FLOW
- PROPOSED PRIVATE CATCH BASIN (ONSITE)
- EXISTING CATCH BASIN (OFFSITE)
- DETENTION BASIN (HYDROMOD)
  BIO–1 BIORETENTION WITH UNDERDRAIN
  MAINTAINED BY HOA
- DMA / ACRE — DMA ID AND ACREAGE
- LANDSCAPE SLOPES (PRIVATE) WITH BMP's:
  S4 (SD–10, 12) SITE DESIGN/LANDSCAPE PLANNING, EFFICIENT IRRIGATION
  MAINTAINED BY HOA
- LANDSCAPE AREAS (PRIVATE) WITH BMP's:
  S4 (SD–10, 12) SITE DESIGN/LANDSCAPE PLANNING, EFFICIENT IRRIGATION
  MAINTAINED BY HOA
- BIO–7 PROPRIETARY BIOTREATMENT
  MANUFACTURER AND SIZE TBD
- LANDSCAPE AREAS (PRIVATE) WITH BMP's:
  HSC–1 ON LOT INFILTRATION
  S4 (SD–10, 12) SITE DESIGN/LANDSCAPE PLANNING, EFFICIENT IRRIGATION
  ADDITIONAL AREAS TO BE IDENTIFIED
  MAINTAINED BY HOA
- DISCHARGE POINT

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TENTATIVE TRACT MAP NO. 17707
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COUNTY OF ORANGE, CA

CONCEPTUAL WQMP SITE PLAN

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BMP Calculations and Details – On-Lot Infiltration (HSC-1) and Impervious Area Dispersion (HSC-2)

Worksheet A: Hydrologic Source Control Calculation Form

		Drainage area ID	DMA 1A	
		Total drainage area	17.204	acres
		Total drainage area Impervious Area (IA_{total})	10.207	acres
HSC ID	HSC Type/ Description/ Reference BMP Fact Sheet	Effect of individual HSC_i per criteria in BMP Fact Sheets **(**XIV.1**)** (d_{HSCi})[1]	Impervious Area Tributary to HSC_i (IA_i)	$d_i \times IA_i$
XX	Depressed Parkway Landscaping Areas	TBD	TBD	TBD
		Box 1:	$\sum d_i \times IA_i =$	
		Box 2:	$IA_{total} =$	
		[Box 1]/[Box 2]:	$d_{HSC\ total} =$	
			*Percent Capture Provided by HSCs (*Table III.1*)*	

XIV.1. Hydrologic Source Control Fact Sheets (HSC)

HSC-1: Localized On-Lot Infiltration

'Localized on-lot infiltration' refers to the practice of collecting on-site runoff from small distributed areas within a catchment and diverting it to a dedicated on-site infiltration area. This technique can include disconnecting downspouts and draining sidewalks and patios into french drains, trenches, small rain gardens, or other surface depressions. For downspout disconnections and other impervious area disconnection involving dispersion over pervious surfaces, but without intentional ponding, see HSC-2: Impervious Area Dispersion.

Also known as:

- *Downspout infiltration*
- *Retention grading*
- *French drains*
- *On-lot rain gardens*

On-lot rain garden
Source: lowimpactdevelopment.org

Feasibility Screening Considerations

- „Localized on-lot infiltration" shall meet infiltration infeasibility screening criteria to be considered for use.

Opportunity Criteria

- Runoff can be directed to and temporarily pond in pervious area depressions, rock trenches, or similar.
- Soils are adequate for infiltration or can be amended to provide an adequate infiltration rate.
- Shallow utilities are not present below infiltration areas.

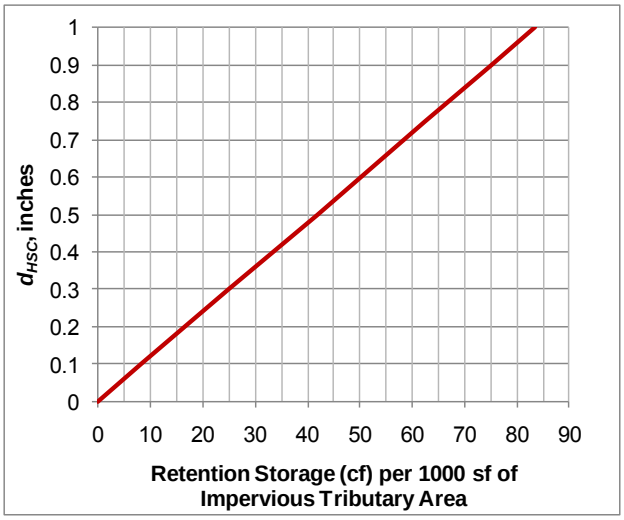
OC-Specific Design Criteria and Considerations

- ☐ A single on-lot infiltration area should not be sized to retain runoff from impervious areas greater than 4,000 sq. ft.; if the drainage area exceeds this criteria, sizing should be based on calculations for bioretention areas or infiltration trenches.
- ☐ Soils should be sufficiently permeable to eliminate ponded water within 24 hours following a 85th percentile, 24-hour storm event.
- ☐ Maximum ponding depth should be should be less than 3 inches and trench depth should be less than 1.5 feet.
- ☐ Infiltration should not be used when the depth to the mounded seasonally high table is within 5 feet of the bottom of infiltrating surface.
- ☐ Infiltration via depression storage, french drains, or rain gardens should be located greater than 8 feet from building foundations.
- ☐ Site slope should be less than 10%.
- ☐ Infiltration unit should not be located within 50 feet of slopes greater than 15 percent.
- ☐ Side slopes of rain garden or depression storage should not exceed 3H:1V.
- ☐ Effective energy dissipation and uniform flow spreading methods should be employed to prevent erosion resulting fromwater entering infiltration areas.

☐ Overflow should be located such that it does not cause erosion orand is conveyed away from structures toward the downstream conveyance and treatment system. .

Calculating HSC Retention Volume

- The retention volume provided by localized on-lot infiltration can be computed as the storage volume provided by surface ponding and the pore space within an amended soil layer or gravel trench.
- Estimate the average retention volume per 1000 square feet impervious tributary area provided by on-lot infiltration.
- Look up the storm retention depth, d_{HSC} from the chart to the right.
- The max d_{HSC} is equal to the design capture storm depth for the project site.



Configuration for Use in a Treatment Train

- Localized on-lot infiltration would typically serve as the first in a treatment train and should only be used where tributary areas do not generate significant sediment that would require pretreatment to mitigate clogging.
- The use of impervious area disconnection reduces the sizing requirement for downstream LID and/or conventional treatment control BMPs.

Additional References for Design Guidance

- LID Center – Rain Garden Design Template. http://www.lowimpactdevelopment.org/raingarden_design/
- University of Wisconsin Extension. Rain Gardens: A How-To Manual for Homeowners. http://learningstore.uwex.edu/assets/pdfs/GWQ037.pdf

HSC-2: Impervious Area Dispersion

Impervious area dispersion refers to the practice of routing runoff from impervious areas, such as rooftops, walkways, and patios onto the surface of adjacent pervious areas. Runoff is dispersed uniformly via splash block or dispersion trench and soaks into the ground as it move slowly across the surface of pervious areas. Minor ponding may occur, but it is not the intent of this practice to actively promote localized on-lot storage (See HSC-1: Localized On-Lot Infiltration).

Also known as:

- *Downspout disconnection*
- *Impervious area disconnection*
- *Sheet flow dispersion*

Simple Downspout Dispersion
Source: toronto.ca/environment/water.htm

Feasibility Screening Considerations

- Impervious area dispersion can be used where infiltration would otherwise be infeasible, however dispersion depth over landscaped areas should be limited by site-specific conditions to prevent standing water or geotechnical issues.

Opportunity Criteria

- Rooftops and other low traffic impervious surface present in drainage area.
- Soils are adequate for infiltration. If not, soils can be amended to improve capacity to absorb dispersed water (see MISC-2: Amended Soils).
- Significant pervious area present in drainage area with shallow slope
- Overflow from pervious area can be safely managed.

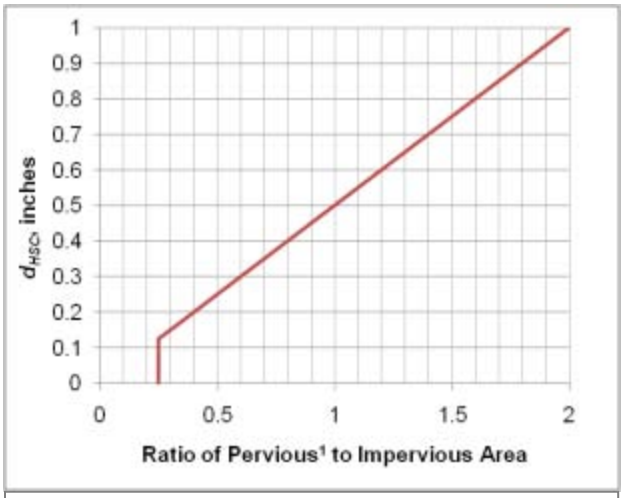
OC-Specific Design Criteria and Considerations

- ☐ Soils should be preserved from their natural condition or restored via soil amendments to meet minimum criteria described in Section .
- ☐ A minimum of 1 part pervious area capable of receiving flow should be provided for every 2 parts of impervious area disconnected.
- ☐ The pervious area receiving flow should have a slope ≤ 2 percent and path lengths of ≥ 20 feet per 1000 sf of impervious area.
- ☐ Dispersion areas should be maintained to remove trash and debris, loose vegetation, and protect any areas of bare soil from erosion.
- ☐ Velocity of dispersed flow should not be greater than 0.5 ft per second to avoid scour.

Calculating HSC Retention Volume

- The retention volume provided by downspout dispersion is a function of the ratio of impervious to pervious area and the condition of soils in the pervious area.
- Determine flow patterns in pervious area and estimate footprint of pervious area receiving dispersed flow. Calculate the ratio of pervious to impervious area.
- Check soil conditions using the soil condition design criteria below; amend if necessary.
- Look up the storm retention depth, d_{HSC} from the chart below.

- The max d_{HSC} is equal to the design storm depth for the project site.



[1] Pervious area used in calculation should only include the pervious area receiving flow, not pervious area receiving only direct rainfall or upslope pervious drainage.

Soil Condition Design Criteria

☐ Maximum slope of 2 percent

☐ Well-established lawn or landscaping

☐ Minimum soil amendments per criteria in MISC-2: Amended Soils.

Configuration for Use in a Treatment Train

- Impervious area disconnection is an HSC that may be used as the first element in any treatment train
- The use of impervious area disconnection reduces the sizing requirement for downstream LID and/or treatment control BMPs

Additional References for Design Guidance

- SMC LID Manual (pp 131) http://www.lowimpactdevelopment.org/guest75/pub/All_Projects/SoCal_LID_Manual/SoCalLID_Manual_FINAL_040910.pdf
- City of Portland Bureau of Environmental Services. 2010. How to manage stormwater – Disconnect Downspouts. http://www.portlandonline.com/bes/index.cfm?c=43081&a=177702
- Seattle Public Utility: http://www.cityofseattle.org/util/stellent/groups/public/@spu/@usm/documents/webcontent/spu01_006395.pdf
- Thurston County, Washington State (pp 10): http://www.co.thurston.wa.us/stormwater/manual/docs-faqs/DG-5-Roof-Runoff-Control_Rev11Jan24.pdf

BMP Calculations and Details – Bioretention with Underdrains

Worksheet C: Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs – DMA 1A (Central)

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.95	inches
2	Enter calculated drawdown time of the proposed BMP based on equation provided in applicable BMP Fact Sheet, *T* (hours) $T = (d_p/K_{design}) \times 12$ in/ft (K_{design} assume 2.5"/hr)	T=	7.2	hours
3	Using Figure III.2, determine the "fraction of design capture storm depth" at which the BMP drawdown time (T) line achieves 80% capture efficiency, X_1	X_1=	0.45	
4	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
5	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	0	%
6	Using Figure III.2, determine the fraction of "design capture storm depth" at which the drawdown time (T) achieves the equivalent of the upstream capture efficiency(Y_2), X_2	X_2=	0	
7	Calculate the fraction of design volume that must be provided by BMP, $fraction = X_1 - X_2$	fraction=	0.45	
8	Calculate the resultant design capture storm depth (inches), $d_{fraction} = fraction \times d$ = (0.45)(0.95") = 0.4275	$d_{fraction}$=	0.4275	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	14.75	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.60	
3	Calculate runoff coefficient, $C= (0.75 \times imp) + 0.15$	C=	0.60	
4	Calculate runoff volume, $V_{design} = (C \times d_{fraction} \times A \times 43560 \times (1/12))$	V_{design}=	13,733.7	cu-ft

Supporting Calculations

Describe system: System consists of basin with 2' depth of engineered media, 1.5' ponding depth and perforated pipes beneath engineered media.

Step 1.8 - $d_{fraction} = fraction \times d$ = (0.25)(0.95") = 0.4275

Step 2.3 – $C= (0.75 \times imp) + 0.15 = (0.75 \times 0.60) + 0.15 = 0.6$

Step 2.4 – $V_{design} = (0.60 \times 0.4275 \times 14.75 \times 43560 \times 1/12) = 13{,}733.7$ ft^3

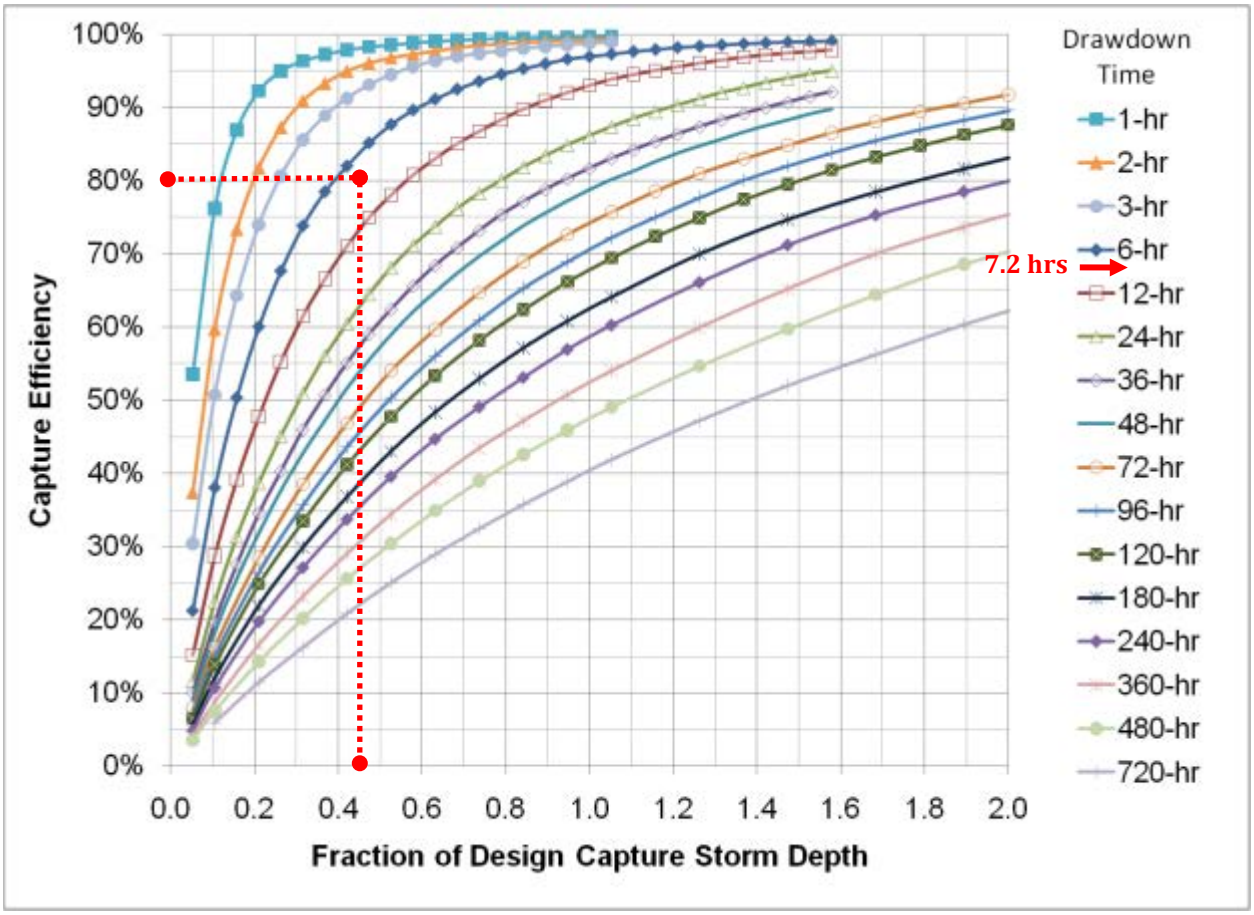
Per Bio-1 of TGD, area needed for BMP = V_{design}/d_p = 13,733.7 ft^3 / 1.5 ft = 9,155.8 ft^2

Simple method DCV = (0.60 x 0.95" x 14.75 x 43560 x 1/12) = 30,519.3 ft^3

Worksheet C: Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs – DMA 1A (Central)

Provide drawdown time calculations per applicable BMP Fact Sheet:
Step 1.2 – Drawdown Time (T) = (d_p/K_{design}) x 12 in/ft (K_{design} assume 2.5"/hr) = (1.5/2.5) x 12 = 7.2 hrs

Graphical Operations



Provide supporting graphical operations. See Example III.6.

Worksheet C: Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs – DMA 1B (East)

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.95	inches
2	Enter calculated drawdown time of the proposed BMP based on equation provided in applicable BMP Fact Sheet, *T* (hours) $T = (d_p/K_{design}) \times 12$ in/ft (K_{design} assume 2.5"/hr)	T=	7.2	hours
3	Using Figure III.2, determine the "fraction of design capture storm depth" at which the BMP drawdown time (T) line achieves 80% capture efficiency, X_1	X_1=	0.45	
4	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
5	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	0	%
6	Using Figure III.2, determine the fraction of "design capture storm depth" at which the drawdown time (T) achieves the equivalent of the upstream capture efficiency(Y_2), X_2	X_2=	0	
7	Calculate the fraction of design volume that must be provided by BMP, $fraction = X_1 - X_2$	fraction=	0.45	
8	Calculate the resultant design capture storm depth (inches), $d_{fraction} = fraction \times d$ = (0.45)(0.95") = 0.4275	$d_{fraction}$=	0.4275	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	11.15	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.75	
3	Calculate runoff coefficient, $C= (0.75 \times imp) + 0.15$	C=	0.7125	
4	Calculate runoff volume, $V_{design} = (C \times d_{fraction} \times A \times 43560 \times (1/12))$	V_{design}=	12,174.6	cu-ft

Supporting Calculations

Describe system: System consists of basin with 2' depth of engineered media, 1.5' ponding depth and perforated pipes beneath engineered media.

Step 1.8 - $d_{fraction} = fraction \times d$ = (0.25)(0.95") = 0.4275

Step 2.3 – $C= (0.75 \times imp) + 0.15 = (0.75 \times 0.2) + 0.15 = 0.7125$

Step 2.4 – $V_{design} = (0.7125 \times 0.4275 \times 11.15 \times 43560 \times 1/12) = 12{,}382.3$ ft^3

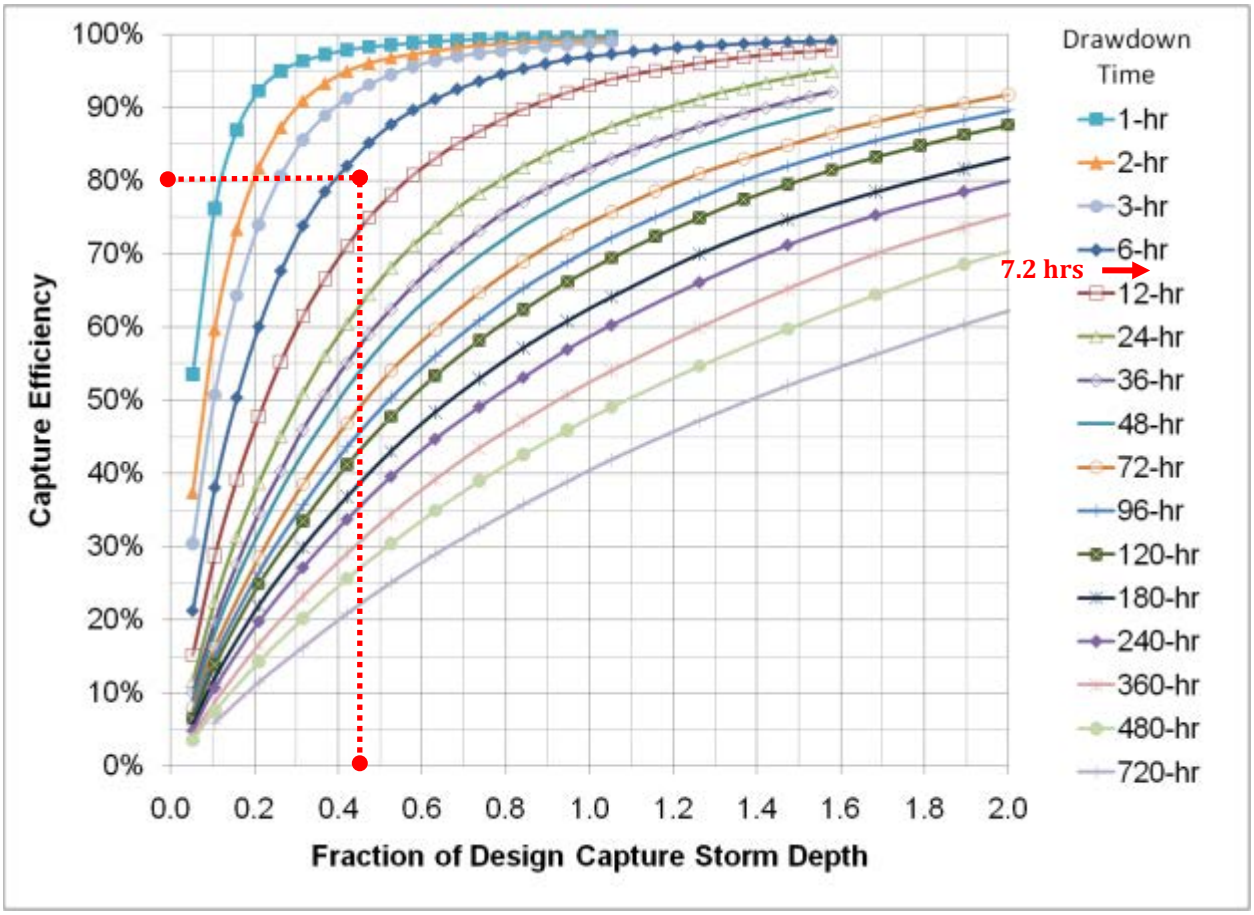
Per Bio-1 of TGD, area needed for BMP = V_{design}/d_p = 12,382.3 ft^3 / 1.5 ft = 8,218.9 ft^2

Simple method DCV = (0.7125 x 0.95" x 11.011 x 43560 x 1/12) = 27,396.2 ft^3

Worksheet C: Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs – DMA 1B (East)

Provide drawdown time calculations per applicable BMP Fact Sheet:
Step 1.2 – Drawdown Time (T) = (d_p/K_{design}) x 12 in/ft (K_{design} assume 2.5"/hr) = (1.5/2.5) x 12 = 7.2 hrs

Graphical Operations



Provide supporting graphical operations. See Example III.6.

XIV.5. Biotreatment BMP Fact Sheets (BIO)

Conceptual criteria for biotreatment BMP selection, design, and maintenance are contained in **Appendix XII**. These criteria are generally applicable to the design of biotreatment BMPs in Orange County and BMP-specific guidance is provided in the following fact sheets.

*Note: Biotreatment BMPs shall be designed to provide the maximum feasible infiltration and ET based on criteria contained in **Appendix XI.2**.*

BIO-1: Bioretention with Underdrains

Bioretention stormwater treatment facilities are landscaped shallow depressions that capture and filter stormwater runoff. These facilities function as a soil and plant-based filtration device that removes pollutants through a variety of physical, biological, and chemical treatment processes. The facilities normally consist of a ponding area, mulch layer, planting soils, and plants. As stormwater passes down through the planting soil, pollutants are filtered, adsorbed, biodegraded, and sequestered by the soil and plants. Bioretention with an underdrain are utilized for areas with low permeability native soils or steep slopes where the underdrain system that routes the treated runoff to the storm drain system rather than depending entirely on infiltration. **Bioretention must be designed without an underdrain** in areas of high soil permeability.

Also known as:

- *Rain gardens with underdrains*
- *Vegetated media filter*
- *Downspout planter boxes*

Bioretention
Source: Geosyntec Consultants

Feasibility Screening Considerations

- If there are no hazards associated with infiltration (such as groundwater concerns, contaminant plumes or geotechnical concerns), **bioinfiltration facilities**, which achieve partial infiltration, should be used to maximize infiltration.
- Bioretention with underdrain facilities should be lined if contaminant plumes or geotechnical concerns exist. If high groundwater is the reason for infiltration infeasibility, bioretention facilities with underdrains do not need to be lined.

Opportunity Criteria

- Land use may include commercial, residential, mixed use, institutional, and subdivisions. Bioretention may also be applied in parking lot islands, cul-de-sacs, traffic circles, road shoulders, road medians, and next to buildings in planter boxes.
- Drainage area is ≤ 5 acres.
- Area is available for infiltration.

- Site must have adequate relief between land surface and the stormwater conveyance system to permit vertical percolation through the soil media and collection and conveyance in underdrain to stormwater conveyance system.

OC-Specific Design Criteria and Considerations

☐ Ponding depth should not exceed 18 inches; fencing may be required if ponding depth is greater than 6 inches to mitigate drowning.

☐ The minimum soil depth is 2 feet (3 feet is preferred).

☐ The maximum drawdown time of the bioretention ponding area is 48 hours. The maximum drawdown time of the planting media and gravel drainage layer is 96 hours, if applicable.

☐ Infiltration pathways may need to be restricted due to the close proximity of roads, foundations, or other infrastructure. A geomembrane liner, or other equivalent water proofing, may be placed along the vertical walls to reduce lateral flows. This liner should have a minimum thickness of 30 mils.

☐ If infiltration in bioretention location is hazardous due to groundwater or geotechnical concerns, a geomembrane liner must be installed at the base of the bioretention facility. This liner should have a minimum thickness of 30 mils.

☐ The planting media placed in the cell shall be designed per the recommendations contained in MISC-1: Planting/Storage Media

☐ Plant materials should be tolerant of summer drought, ponding fluctuations, and saturated soil conditions for 48 hours; native place species and/or hardy cultivars that are not invasive and do not require chemical inputs should be used to the maximum extent feasible

☐ The bioretention area should be covered with 2-4 inches (average 3 inches) or mulch at the start and an additional placement of 1-2 inches of mulch should be added annually.

☐ Underdrain should be sized with a 6 inch minimum diameter and have a 0.5% minimum slope. Underdrain should be slotted polyvinyl chloride (PVC) pipe; underdrain pipe should be more than 5 feet from tree locations (if space allows).

☐ A gravel blanket or bedding is required for the underdrain pipe(s). At least 0.5 feet of washed aggregate must be placed below, to the top, and to the sides of the underdrain pipe(s).

☐ An overflow device is required at the top of the bioretention area ponding depth.

☐ Dispersed flow or energy dissipation (i.e. splash rocks) for piped inlets should be provided at basin inlet to prevent erosion.

☐ Ponding area side slopes shall be no steeper than 3:1 (H:V) unless designed as a planter box BMP with appropriate consideration for trip and fall hazards.

Simple Sizing Method for Bioretention with Underdrain

If the Simple Design Capture Volume Sizing Method described in **Appendix III.3.1** is used to size a bioretention with underdrain facility, the user selects the basin depth and then determines the appropriate surface area to capture the DCV. The sizing steps are as follows:

Step 1: Determine DCV

Calculate the DCV using the Simple Design Capture Volume Sizing Method described in **Appendix III.3.1**.

Step 2: Verify that the Ponding Depth will Draw Down within 48 Hours

The ponding area drawdown time can be calculated using the following equation:

$DD_P = (d_P / K_{MEDIA}) \times 12$ in/ft

Where:

DD_P = time to drain ponded water, hours

d_P = depth of ponding above bioretention area, ft (not to exceed 1.5 ft)

K_{MEDIA} = media design infiltration rate, in/hr (equivalent to the media hydraulic conductivity with a factor of safety of 2; K_{MEDIA} of 2.5 in/hr should be used unless other information is available)

If the drawdown time exceeds 48 hours, adjust ponding depth and/or media infiltration rate until 48 hour drawdown time is achieved.

Step 3: Determine the Depth of Water Filtered During Design Capture Storm

The depth of water filtered during the design capture storm can be estimated as the amount routed through the media during the storm, or the ponding depth, whichever is smaller.

$d_{FILTERED}$ = Minimum [$((K_{MEDIA} \times T_{ROUTING})/12)$, d_P]

Where:

$d_{FILTERED}$ = depth of water that may be considered to be filtered during the design storm event, ft

K_{MEDIA} = media design infiltration rate, in/hr (equivalent to the media hydraulic conductivity with a factor of safety of 2; K_{MEDIA} of 2.5 in/hr should be used unless other information is available)

$T_{ROUTING}$ = storm duration that may be assumed for routing calculations; this should be assumed to be no greater than 3 hours. If the designer desires to account for further routing effects, the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (See **Appendix III.3.2**) should be used.

d_P = depth of ponding above bioretention area, ft (not to exceed 1.5 ft)

Step 4: Determine the Facility Surface Area

$A = DCV / (d_P + d_{FILTERED})$

Where:

A = required area of bioretention facility, sq-ft

DCV = design capture volume, cu-ft

$d_{FILTERED}$ = depth of water that may be considered to be filtered during the design storm event, ft

d_P = depth of ponding above bioretention area, ft (not to exceed 1.5 ft)

Capture Efficiency Method for Bioretention with Underdrains

If the bioretention geometry has already been defined and the user wishes to account more explicitly for routing, the user can determine the required footprint area using the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (See **Appendix III.3.2**) to determine the fraction of the DCV that must be provided to manage 80 percent of average annual runoff volume. This method accounts for drawdown time different than 48 hours.

Step 1: Determine the drawdown time associated with the selected basin geometry

$DD = (d_p / K_{DESIGN}) \times 12$ in/ft

Where:

DD = time to completely drain infiltration basin ponding depth, hours

d_P = bioretention ponding depth, ft (should be less than or equal to 1.5 ft)

K_{DESIGN} = design media infiltration rate, in/hr (assume 2.5 inches per hour unless otherwise proposed)

If drawdown is less than 3 hours, the drawdown time should be rounded to 3 hours or the Capture Efficiency Method for Flow-based BMPs (See **Appendix III.3.3**) shall be used.

Step 2: Determine the Required Adjusted DCV for this Drawdown Time

Use the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (See **Appendix III.3.2**) to calculate the fraction of the DCV the basin must hold to achieve 80 percent capture of average annual stormwater runoff volume based on the basin drawdown time calculated above.

Step 3: Determine the Basin Infiltrating Area Needed

The required infiltrating area (i.e. the surface area of the top of the media layer) can be calculated using the following equation:

$A = \text{Design Volume} / d_p$

Where:

A = required infiltrating area, sq-ft (measured at the media surface)

Design Volume = fraction of DCV, adjusted for drawdown, cu-ft (see Step 2)

d_p = ponding depth of water stored in bioretention area, ft (from Step 1)

This does not include the side slopes, access roads, etc. which would increase bioretention footprint. If the area required is greater than the selected basin area, adjust surface area or adjust ponding depth and recalculate required area until the required area is achieved.

Configuration for Use in a Treatment Train

- Bioretention areas may be preceeded in a treatment train by HSCs in the drainage area, which would reduce the required design volume of the bioretention cell. For example, bioretention could be used to manage overflow from a cistern.
- Bioretention areas can be used to provide pretreatment for underground infiltration systems.

Additional References for Design Guidance

- CASQA BMP Handbook for New and Redevelopment: **http://www.cabmphandbooks.com/Documents/Development/TC-32.pdf**
- SMC LID Manual (pp 68): **http://www.lowimpactdevelopment.org/guest75/pub/All_Projects/SoCal_LID_Manual/SoCalLID_Manual_FINAL_040910.pdf**
- Los Angeles County Stormwater BMP Design and Maintenance Manual, Chapter 5: **http://dpw.lacounty.gov/DES/design_manuals/StormwaterBMPDesignandMaintenance.pdf**
- San Diego County LID Handbook Appendix 4 (Factsheet 7): **http://www.sdcounty.ca.gov/dplu/docs/LID-Appendices.pdf**

  Los Angeles Unified School District (LAUSD) Stormwater Technical Manual, Chapter 4: **http://www.laschools.org/employee/design/fs-studies-and-reports/download/white_paper_report_material/Storm_Water_Technical_Manual_2009-opt-red.pdf?version_id=76975850**
- County of Los Angeles Low Impact Development Standards Manual, Chapter 5: **http://dpw.lacounty.gov/wmd/LA_County_LID_Manual.pdf**

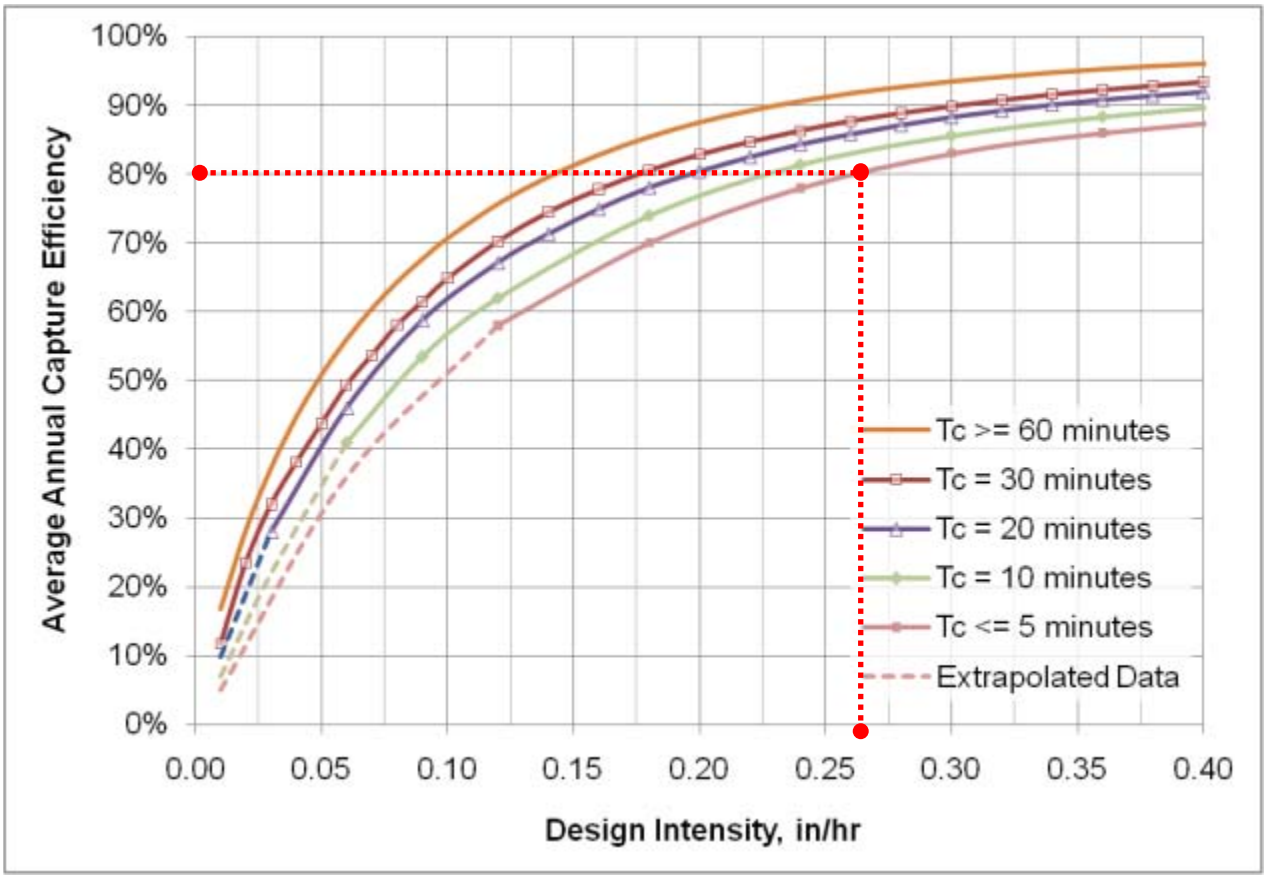
BMP Calculations and Details – Proprietary Biotreatment (BIO-7)

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c=	5	Min
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=	0.27	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	0	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2=	0	
6	Determine the design intensity that must be provided by BMP, $I_{design} = I_1 - I_2$	I_{design}=	0.27	
Step 2: Calculate the design flowrate				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	2.91	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.60	
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	C=	0.60	
4	Calculate design flowrate, $Q_{design} = (C \times i_{design} \times A)$	Q_{design}=	0.472	cfs
Supporting Calculations				
Describe system: Runoff conveyed as gutter flow on either side of street to 1 of 2 proprietary biotreatment BMPs (eg. Katchall Purestream, Filterra, MWS, etc.) located on either side of catch basin inlet.				
Provide time of concentration assumptions: Assume 5 minutes.				

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Graphical Operations



Provide supporting graphical operations. See Example III.7.

BIO-7: Proprietary Biotreatment

Proprietary biotreatment devices are devices that are manufactured to mimic natural systems such as bioretention areas by incorporating plants, soil, and microbes engineered to provide treatment at higher flow rates or volumes and with smaller footprints than their natural counterparts. Incoming flows are typically filtered through a planting media (mulch, compost, soil, plants, microbes, etc.) and either infiltrated or collected by an underdrain and delivered to the storm water conveyance system. Tree box filters are an increasingly common type of proprietary biotreatment device that are installed at curb level and filled with a bioretention type soil. For low to moderate flows they operate similarly to bioretention systems and are bypassed during high flows. Tree box filters are highly adaptable solutions that can be used in all types of development and in all types of soils but are especially applicable to dense urban parking lots, street, and roadways.

Also known as:

- *Catch basin planter box*
- *Bioretention vault*
- *Tree box filter*

Proprietary biotreatment
Source: http://www.americastusa.com /index.php/filterra/

Feasibility Screening Considerations

- Proprietary biotreatment devices that are unlined may cause incidental infiltration. Therefore, an evaluation of site conditions should be conducted to evaluate whether the BMP should include an impermeable liner to avoid infiltration into the subsurface.

Opportunity Criteria

- Drainage areas of 0.25 to 1.0 acres.
- Land use may include commercial, residential, mixed use, institutional, and subdivisions. Proprietary biotreatment facilities may also be applied in parking lot islands, traffic circles, road shoulders, and road medians.
- Must not adversely affect the level of flood protection provided by the drainage system.

OC-Specific Design Criteria and Considerations

☐ Frequent maintenance and the use of screens and grates to keep trash out may decrease the likelihood of clogging and prevent obstruction and bypass of incoming flows.

☐ Consult proprietors for specific criteria concerning the design and performance.

☐ Proprietary biotreatment may include specific media to address pollutants of concern. However, for proprietary device to be considered a biotreatment device the media must be capable of supporting rigorous growth of vegetation.

☐ Proprietary systems must be acceptable to the reviewing agency. Reviewing agencies shall have the discretion to request performance information. Reviewing agencies shall have the discretion to deny the use of a proprietary BMP on the grounds of performance, maintenance considerations, or other relevant factors.

☐ In right of way areas, plant selection should not impair traffic lines of site. Local jurisdictions may also limit plant selection in keeping with landscaping themes.

Computing Sizing Criteria for Proprietary Biotreatment Device

- Proprietary biotreatment devices can be volume based or flow-based BMPs.
- Volume-based proprietary devices should be sized using the Simple Design Capture Volume Sizing Method described in **Appendix III.3.1** or the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs described in **Appendix III.3.2**.
- The required design flowrate for flow-based proprietary devices should be computed using the Capture Efficiency Method for Flow-based BMPs described in **Appendix III.3.3**).

Additional References for Design Guidance

- Los Angeles Unified School District (LAUSD) Stormwater Technical Manual, Chapter 4: **http://www.laschools.org/employee/design/fs-studies-and-reports/download/white_paper_report_material/Storm_Water_Technical_Manual_2009-opt-red.pdf?version_id=76975850**
- Los Angeles County Stormwater BMP Design and Maintenance Manual, Chapter 9: **http://dpw.lacounty.gov/DES/design_manuals/StormwaterBMPDesignandMaintenance.pdf**
- Santa Barbara BMP Guidance Manual, Chapter 6: **http://www.santabarbaraca.gov/NR/rdonlyres/91D1FA75-C185-491E-A882-49EE17789DF8/0/Manual_071008_Final.pdf**

Section VII Educational Materials

Education Materials			
Residential Material (http://www.ocwatersheds.com)	Check If Applicable	Business Material (http://www.ocwatersheds.com)	Check If Applicable
The Ocean Begins at Your Front Door	☒	Tips for the Automotive Industry	☐
Tips for Car Wash Fund-raisers	☐	Tips for Using Concrete and Mortar	☐
Tips for the Home Mechanic	☒	Tips for the Food Service Industry	☐
Homeowners Guide for Sustainable Water Use	☒	Proper Maintenance Practices for Your Business	☐
Household Tips	☒	Other Material	Check If Attached
Proper Disposal of Household Hazardous Waste	☒		
Recycle at Your Local Used Oil Collection Center (North County)	☐		☐
Recycle at Your Local Used Oil Collection Center (Central County)	☐		☐
Recycle at Your Local Used Oil Collection Center (South County)	☒		☐
Tips for Maintaining a Septic Tank System	☐		☐
Responsible Pest Control	☒		☐
Sewer Spill	☐		☐
Tips for the Home Improvement Projects	☒		☐
Tips for Horse Care	☐		☐
Tips for Landscaping and Gardening	☒		☐
Tips for Pet Care	☒		☐
Tips for Pool Maintenance	☐		☐
Tips for Residential Pool, Landscape and Hardscape Drains	☐		☐
Tips for Projects Using Paint	☒		☐

Attachment A

Educational Materials

Educational Materials to be provided in Final WQMP for dispersal to HOA and Homeowners, as appropriate.

Attachment B

O & M Plan

See Section V. Signed/Notarized O&M Plan to be provided at Final WQMP.

Appendix H

Noise Impact Analysis

NOISE IMPACT ANALYSIS

BAKER RANCH PROPERTIES

CITY OF LAKE FOREST, CALIFORNIA

LSA

November 2013

NOISE IMPACT ANALYSIS

BAKER RANCH PROPERTIES

CITY OF LAKE FOREST, CALIFORNIA

Submitted to:

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LSA

November 2013

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APPENDIX

A: FHWA HIGHWAY TRAFFIC NOISE PREDICTION MODEL OUTPUT

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BAKER RANCH PROPERTIES

1.0 INTRODUCTION

This noise impact analysis has been prepared to evaluate the potential noise impacts and mitigation measures associated with the Baker Ranch Properties residential development (proposed project) in the City of Lake Forest (City), California. This report is intended to satisfy the City's requirement for a project-specific noise impact analysis and examines the impacts of the proposed noise-sensitive uses on the project site together with the project design features and standard conditions. Since the area that includes the proposed project was within the area analyzed in the City's certified Program Environmental Impact Report for the Opportunity Study Area (PEIR), certain mitigation measures from the PEIR will be implemented by the proposed project. Modeled noise levels are based upon vehicle data included in a traffic study prepared for the proposed project (RBF Consulting [RBF], October 2013).

1.1 Project Description

The proposed project site is 30.036 acres and is bounded by State Route 241 (SR-241) to the north, Rancho Parkway to the south, Portola Parkway to the east, and existing commercial/industrial uses to the west. The project location is illustrated in Figure 1, and the project conceptual plan is illustrated in Figure 2. The Baker Ranch Properties land uses include up to 250 single-family dwelling units (DU), a swimming pool/recreational area, and a water quality control basin.

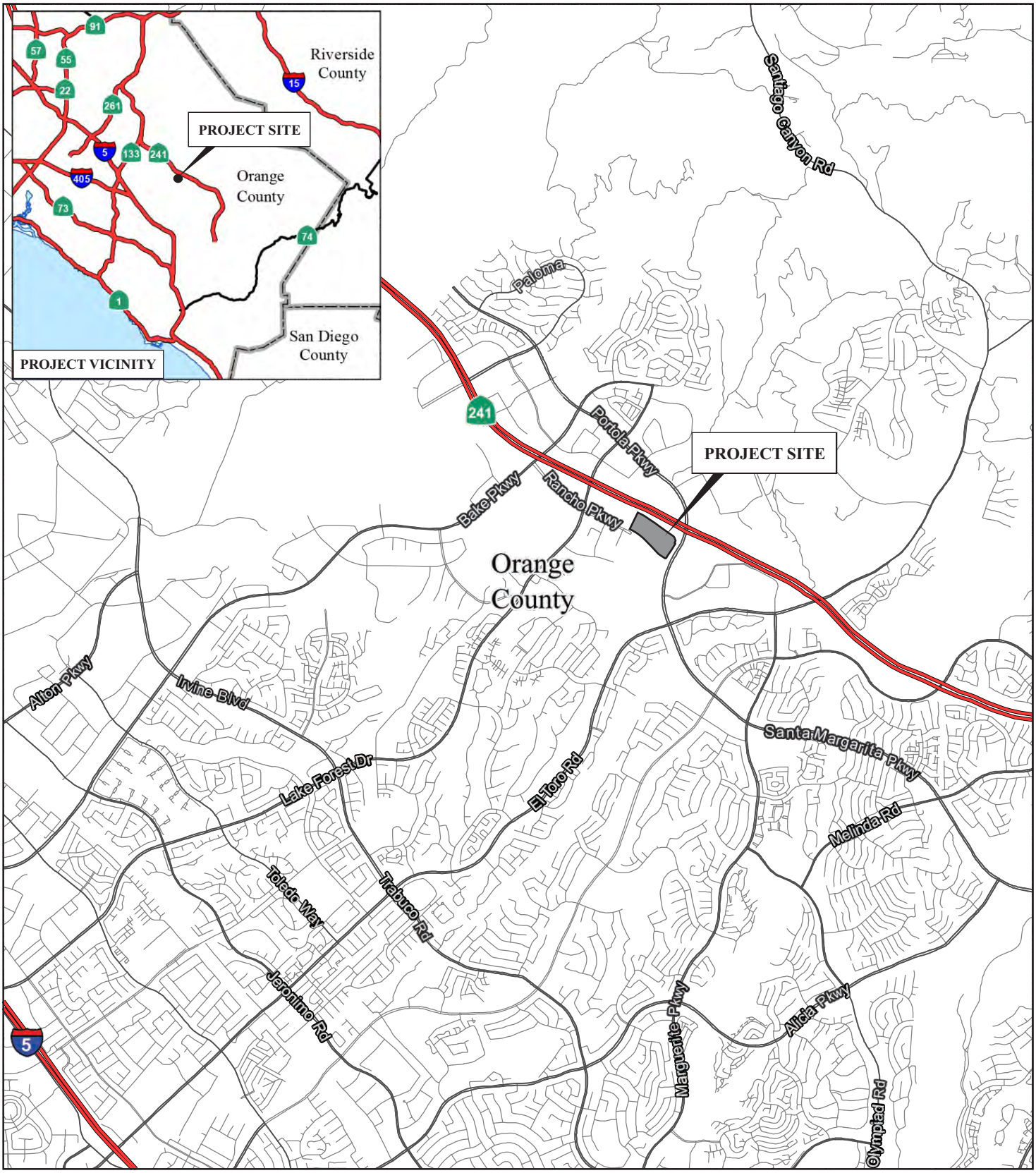
1.2 Approaches Used in the Noise Impact Assessment

Evaluation of noise impacts associated with the proposed project includes the following:

- Determine the short-term construction noise impacts on off-site sensitive receptors,
- Determine the long-term off-site mobile- and stationary-source noise impacts on on-site noise-sensitive receptors, and
- Evaluate the prior-adopted standard conditions, mitigation measures together with any project design features and determine if additional mitigation measures are required to reduce short-term and long-term on-site and off-site noise impacts.

1.3 Characteristics of Sound

Sound is increasing to such disagreeable levels in our environment that it can threaten our quality of life. Noise is usually defined as unwanted sound. Noise consists of any sound that may produce physiological or psychological damage and/or interfere with communication, work, rest, recreation, and sleep. To the human ear, sound has two significant characteristics: pitch and loudness. Pitch is generally an annoyance, while loudness can affect our ability to hear. Pitch is the number of complete



LSA

FIGURE 1

N

0 2000 4000
FEET

SOURCE: Bing Maps (c. 2008); ESRI (2008

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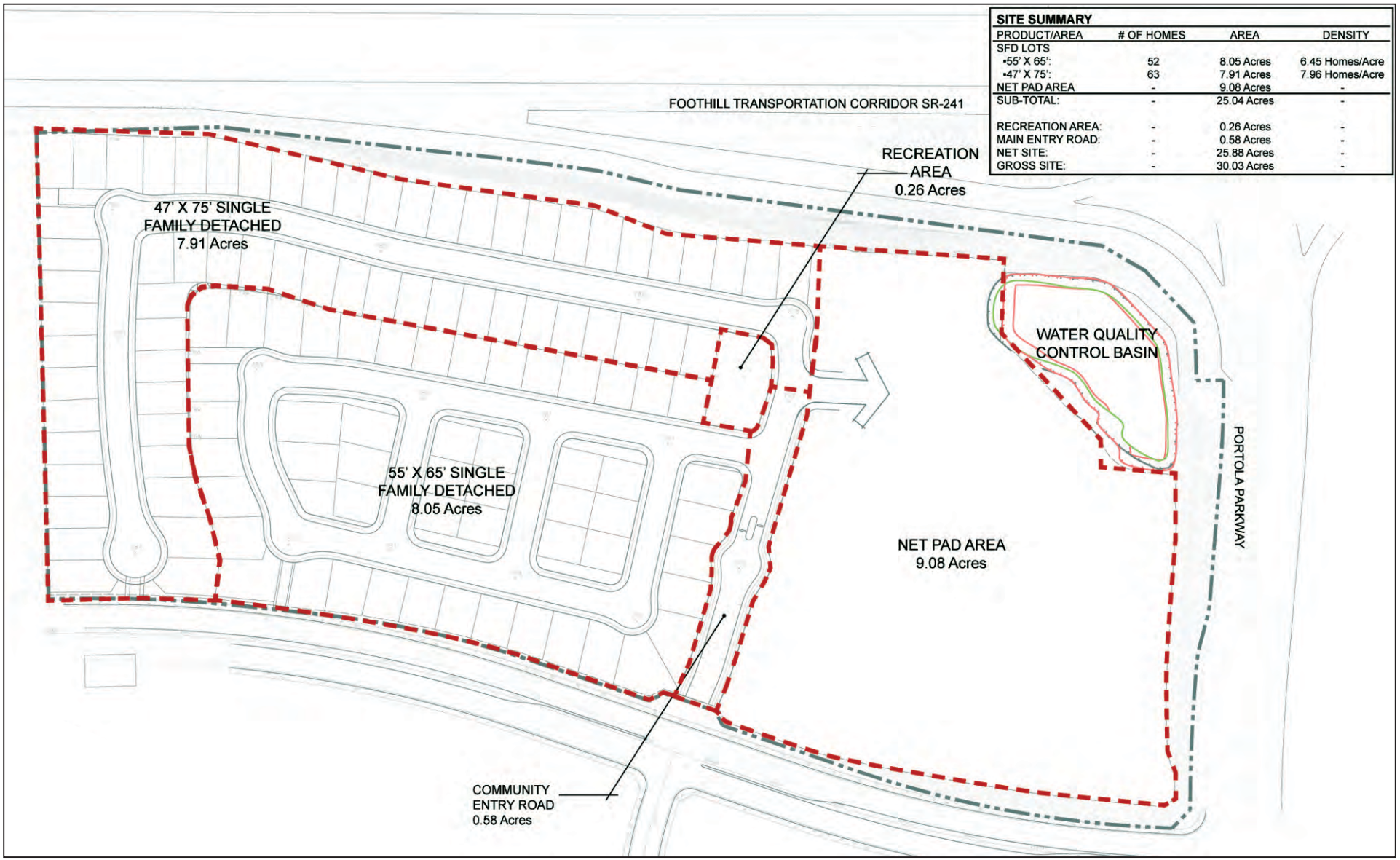
Baker Ranch Properties

Project Location Map



SITE SUMMARY

PRODUCT/AREA	# OF HOMES	AREA	DENSITY
SFD LOTS			
•55' X 65':	52	8.05 Acres	6.45 Homes/Acre
•47' X 75':	63	7.91 Acres	7.96 Homes/Acre
NET PAD AREA	-	9.08 Acres	-
SUB-TOTAL:	-	25.04 Acres	-
RECREATION AREA:	-	0.26 Acres	-
MAIN ENTRY ROAD:	-	0.58 Acres	-
NET SITE:	-	25.88 Acres	-
GROSS SITE:	-	30.03 Acres	-

LSA

FIGURE 2

N

0 100 200
FEET

SOURCE: Bassenian/Lagoni Architecture Planning Interiors

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Baker Ranch Properties

Site Plan

vibrations, or cycles per second, of a wave resulting in the tone's range from high to low. Loudness is the strength of a sound that describes a noisy or quiet environment and is measured by the amplitude of the sound wave. Loudness is determined by the intensity of the sound waves, combined with the reception characteristics of the human ear. Sound intensity refers to how hard the sound wave strikes an object, which in turn produces the sound's effect. This characteristic of sound can be precisely measured with instruments. The analysis of a project defines the noise environment of the project area in terms of sound intensity and its effect on adjacent sensitive land uses.

1.4 Measurement of Sound

Sound intensity is measured through the A-weighted scale to correct for the relative frequency response of the human ear. That is, an A-weighted noise level de-emphasizes low and very high frequencies of sound similar to the human ear's de-emphasis of these frequencies. Unlike linear units, such as inches or pounds, decibels (dB) are measured on a logarithmic scale representing points on a sharply rising curve.

For example, 10 dB are 10 times more intense than 1 dB, 20 dB are 100 times more intense, and 30 dB are 1,000 times more intense. Thirty dB represent 1,000 times as much acoustic energy as 1 dB. The dB scale increases as the square of the change, representing the sound pressure energy. A sound as soft as human breathing is about 10 times greater than 0 dB. The dB system of measuring sound gives a rough connection between the physical intensity of sound and its perceived loudness to the human ear. A 10 dB increase in sound level is perceived by the human ear as only a doubling of the loudness of the sound. Ambient sounds generally range from 30 A-weighted decibels (dBA) (very quiet) to 100 dBA (very loud).

Sound levels are generated from a source, and their dB level decreases as the distance from that source increases. Sound dissipates exponentially with distance from the noise source. For a single point source, sound levels decrease approximately 6 dBA for each doubling of distance from the source. This drop-off rate is appropriate for noise generated by stationary equipment. If noise is produced by a line source, such as highway traffic or railroad operations, the sound decreases 3 dBA for each doubling of distance in a hard site environment. Line source, noise in a relatively flat environment with absorptive vegetation, decreases 4.5 dBA for each doubling of distance.

There are many ways to rate noise for various time periods, but an appropriate rating of ambient noise affecting humans also accounts for the annoying effects of sound. Equivalent continuous sound level (L_{eq}) is the total sound energy of time varying noise over a sample period. However, the predominant rating scales for human communities in the State of California are the L_{eq} and community noise equivalent level (CNEL) or the day-night average level (L_{dn}) based on dBA. CNEL is the time varying noise over a 24-hour period, with a 5 dBA weighting factor applied to the hourly L_{eq} for noises occurring from 7:00 p.m. to 10:00 p.m. (defined as relaxation hours) and a 10 dBA weighting factor applied to noise occurring from 10:00 p.m. to 7:00 a.m. (defined as sleeping hours). L_{dn} is similar to the CNEL scale, but without the adjustment for events occurring during the evening hours. CNEL and L_{dn} are within 1 dBA of each other and are normally exchangeable. The City of Lake Forest uses the CNEL noise scale for long-term noise impact assessment.

Other noise rating scales of importance when assessing the annoyance factor include the maximum instantaneous noise level (L_{max}), which is the highest exponential time averaged sound level that occurs during a stated time period. The noise environments discussed in this analysis for short-term noise impacts are specified in terms of maximum levels denoted by L_{max}, which reflects peak operating conditions and addresses the annoying aspects of intermittent noise. It is often used together with another noise scale, or noise standards in terms of percentile noise levels, in noise ordinances for enforcement purposes. For example, the L_{10} noise level represents the noise level exceeded 10 percent of the time during a stated period. The L_{50} noise level represents the median noise level. One-half the time the noise level exceeds this level, and one-half the time it is less than this level. The L_{90} noise level represents the noise level exceeded 90 percent of the time and is considered the background noise level during a monitoring period. For a relatively constant noise source, the L_{eq} and L_{50} are approximately the same.

Noise impacts can be described in three categories. The first is audible impacts that refer to increases in noise levels noticeable to humans. Audible increases in noise levels generally refer to a change of 3.0 dB or greater since this level has been found to be barely perceptible in exterior environments. The second category, potentially audible, refers to a change in the noise level between 1.0 and 3.0 dB. This range of noise levels has been found to be noticeable only in laboratory environments. The last category is changes in noise level of less than 1.0 dB, which are inaudible to the human ear. Only audible changes in existing ambient or background noise levels are considered potentially significant.

1.5 Physiological Effects of Noise

Physical damage to human hearing begins at prolonged exposure to noise levels higher than 85 dBA. Exposure to high noise levels affects our entire system, with prolonged noise exposure in excess of 75 dBA increasing body tensions, thereby affecting blood pressure and functions of the heart and the nervous system. In comparison, extended periods of noise exposure above 90 dBA would result in permanent cell damage. When the noise level reaches 120 dB, a tickling sensation occurs in the human ear even with short-term exposure. This level of noise is called the threshold of feeling. As the sound reaches 140 dB, the tickling sensation is replaced by the feeling of pain in the ear. This is called the threshold of pain. A sound level of 160 to 165 dB will result in dizziness or loss of equilibrium. The ambient or background noise problem is widespread and generally more concentrated in urban areas than in outlying less developed areas.

Table A lists “Definitions of Acoustical Terms,” and Table B shows “Common Sound Levels and Their Noise Sources.”

Table A: Definitions of Acoustical Terms

Term	Definitions
Decibel, dB	A unit of level that denotes the ratio between two quantities proportional to power; the number of decibels is 10 times the logarithm (to the base 10) of this ratio.
Frequency, Hz	Of a function periodic in time, the number of times that the quantity repeats itself in one second (i.e., number of cycles per second).
A-Weighted Sound Level, dBA	The sound level obtained by use of A-weighting. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this report are A-weighted, unless reported otherwise.
L_{01}, L_{10}, L_{50}, L_{90}	The fast A-weighted noise levels equaled or exceeded by a fluctuating sound level for 1 percent, 10 percent, 50 percent, and 90 percent of a stated time period.
Equivalent Continuous Noise Level, L_{eq}	The level of a steady sound that, in a stated time period and at a stated location, has the same A-weighted sound energy as the time varying sound.
Community Noise Equivalent Level, CNEL	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of five decibels to sound levels occurring in the evening from 7:00 p.m. to 10:00 p.m. and after the addition of 10 decibels to sound levels occurring in the night between 10:00 p.m. and 7:00 a.m.
Day/Night Noise Level, L_{dn}	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 10 decibels to sound levels occurring in the night between 10:00 p.m. and 7:00 a.m.
L_{max}, L_{min}	The maximum and minimum A-weighted sound levels measured on a sound level meter, during a designated time interval, using fast time averaging.
Ambient Noise Level	The all-encompassing noise associated with a given environment at a specified time, usually a composite of sound from many sources at many directions, near and far; no particular sound is dominant.
Intrusive	The noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content, as well as the prevailing ambient noise level.

Source: Handbook of Acoustical Measurements and Noise Control (1991).

Table B: Common Sound Levels and Their Noise Sources

Noise Source	A-Weighted Sound Level in Decibels	Noise Environments	Subjective Evaluations
Near Jet Engine	140	Deafening	128 times as loud
Civil Defense Siren	130	Threshold of Pain	64 times as loud
Hard Rock Band	120	Threshold of Feeling	32 times as loud
Accelerating Motorcycle at a few feet away	110	Very Loud	16 times as loud
Pile Driver; Noisy Urban Street/Heavy City Traffic	100	Very Loud	8 times as loud
Ambulance Siren; Food Blender	95	Very Loud	
Garbage Disposal	90	Very Loud	4 times as loud
Freight Cars; Living Room Music	85	Loud	
Pneumatic Drill; Vacuum Cleaner	80	Loud	2 times as loud
Busy Restaurant	75	Moderately Loud	
Near Freeway Auto Traffic	70	Moderately Loud	Reference Level
Average Office	60	Quiet	½ as loud
Suburban Street	55	Quiet	
Light Traffic; Soft Radio Music in Apartment	50	Quiet	¼ as loud
Large Transformer	45	Quiet	
Average Residence Without Stereo Playing	40	Faint	⅛ as loud
Soft Whisper	30	Faint	
Rustling Leaves	20	Very Faint	
Human Breathing	10	Very Faint	Threshold of Hearing
	0	Very Faint	

Source: Compiled by LSA Associates, Inc. (2003).

2.0 EXISTING CONDITIONS

2.1 Sensitive Land Uses in the Project Vicinity

There are no existing residential uses immediately adjacent to the project site. There are existing commercial and light industrial uses immediately to the west, the Saddleback Church property to the east, and Lake Forest Sports Park (Sports Park) to the south of the project site. The closest existing residential uses are located at least 1,500 feet (ft) to the south or southeast of the project site along El Toro Road.

2.2 Overview of the Existing Noise Environment

The primary existing noise sources in the project area are commercial/industrial uses and transportation facilities. Traffic on State Route 241 (SR 241), Portola Parkway, Rancho Parkway, and other local streets is the main source contributing to the background noise. Vehicles and operations associated with adjacent commercial/warehouse uses also contribute to the ambient noise in the project vicinity. Occasional aircraft overflight generates noise higher than the other more steady background noise sources. However, the project site is not in a flight pattern area (i.e., take off or landing for any airports) and therefore aircraft noise is basically from private planes or high altitude overflight. Other contributing sources include intermittent noise associated with commercial uses to the west of the project site. The ambient noise survey conducted by LSA showed that noise in the project vicinity ranged from 55 to 64 dBA with the most significant contributor being traffic noise.

The Federal Highway Administration (FHWA) highway traffic noise prediction model (FHWA RD-77-108) was used to evaluate highway traffic-related noise conditions along the roadway segments in the project vicinity. Existing traffic volumes in the project's traffic study (RBF Consulting, October 2013) were used to assess the existing traffic noise impacts. A typical vehicle mix for Southern California was used. Table C provides the traffic noise levels along the roadways adjacent to the project site under the existing conditions. These noise levels represent the worst-case scenario, which assumes that no shielding is provided between the traffic and the location where the noise contours are drawn. The specific assumptions used in developing these noise levels and model printouts are provided in Appendix A.

Table C shows that, under existing conditions, traffic noise levels along roadway segments in the project vicinity are moderate to high, with the 70 dBA CNEL confined within the roadway right-of-way along Rancho Parkway. The 65 and 60 dBA CNEL contours extend to 81 ft and 167 ft, respectively, from the centerline of Rancho Parkway. Along Portola Parkway, the 70, 65, and 60 dBA CNEL contours extend to 66 ft, 136 ft, and 288 ft, respectively, from the roadway centerline. SR-241 would have its 70, 65, and 60 dBA CNEL contours extending to 190 ft, 403 ft, and 866 ft, respectively, from the centerline of the toll road.

2.3 Applicable City Noise Standards

A project will normally have a significant effect on the environment related to noise if it will substantially increase the ambient noise levels for adjoining areas or conflict with adopted environmental plans and goals of the community in which it is located. The applicable noise standards governing the project site are the City's noise criteria.

Table C: Existing Traffic Noise Levels

Roadway Segment	ADT	Centerline to 70 CNEL (ft)	Centerline to 65 CNEL (ft)	Centerline to 60 CNEL (ft)	CNEL (dBA) 50 ft from Centerline of Outermost Lane
Rancho Pkwy. west of Lake Forest Dr.	8,300	< 50	82	170	65.7
Rancho Pkwy. between Lake Forest Dr. and Sports Park	8,900	< 50	85	178	66.0
Rancho Parkway between Sports Park and Portola Pkwy.	8,100	< 50	81	167	65.6
Lake Forest Dr. north of Rancho Pkwy.	16,000	61	123	262	68.6
Lake Forest Dr. south of Rancho Pkwy.	18,500	66	136	288	69.2
Portola Pkwy. north of Rancho Pkwy.	23,900	77	160	342	70.3
Portola Pkwy. south of Rancho Pkwy.	30,600	90	188	403	71.4
SR-241 toll road	39,900	190	403	866	75.7

Source: LSA Associates, Inc. (October 2013).
Notes: Traffic noise within 50 ft of the roadway centerline should be evaluated with site-specific information. Modeled using the "Soft" setting and the Orange County default fleet percentages on Rancho Parkway, and Caltrans data for the SR-241 toll road.
ADT = average daily traffic
Caltrans = California Department of Transportation
CNEL = Community Noise Equivalent Level
dBA = A-weighted decibels
ft = foot/feet
SR-241 = State Route 241

Noise Element of the General Plan. Applicable policies and standards governing environmental noise in the City of Lake Forest are set forth in the Noise Element of the General Plan. The Noise Element was compiled under the mandate of Section 653021(g) of the California Government Code and guidelines prepared by the California Department of Health Services (DHS). The Noise Element quantifies the community noise environment in terms of noise exposure contours for both near- and long-term levels of growth and traffic activity.

Table D lists State compatibility guidelines for various land uses. For example, a residential use is acceptable in areas with up to 60 dBA CNEL. Residential uses in a 60-70 dBA CNEL zone would be appropriate only with certain mitigation. For commercial or business office buildings, noise levels up to 70 dBA CNEL are conditionally acceptable with noise insulation. In areas with noise levels from 70 to 75 dBA CNEL, construction of commercial/business office buildings would require acoustic analysis to determine the insulation needed.

Table E presents the City of Lake Forest's interior and exterior noise standards for assessing the compatibility of land uses with the noise environment. This matrix may be used to determine whether a certain type of land use is appropriate in a particular CNEL zone. The City requires that all outdoor living areas associated with new residential uses be attenuated to less than 65 dBA CNEL. All new residential units and noise-sensitive land uses shall have an interior noise level in living areas no greater than 45 dBA CNEL.

The City also enforces building sound transmission loss and indoor fresh-air ventilation requirements specified in Chapter 35 of the Uniform Building Code.

Table D: Noise/Land Use Compatibility Matrix

Land Use Category	50 dBA	55 dBA	60 dBA	65 dBA	70 dBA	75 dBA	80 dBA
Residential – Single-Family, Multifamily, Duplex	A	A	B	B	C	C	D
Residential – Mobile Homes	A	A	A	B	C	C	D
Transient Lodging – Motels, Hotels	A	A	A	B	B	C	D
Schools, Libraries, Churches, Hospitals, Nursing/Convalescent Homes, Preschools, Day Care Centers	A	A	A	B	C	C	D
Auditoriums, Concert Halls, Amphitheaters, Meeting Halls	B	B	B	C	D	D	D
Sports Areas, Outdoor Spectator Sports, Amusement Parks	A	A	A	A	B	B	D
Playgrounds, Neighborhood Parks	A	A	A	A	B	C	D
Golf Courses, Riding Stables, Cemeteries	A	A	A	A	A	B	C
Office and Professional Buildings	A	A	A	A	B	B	C
Commercial Retail, Banks, Restaurants, Theaters	A	A	A	A	A	B	B
Industrial, Manufacturing, Utilities, Wholesale, Service Stations	A	A	A	A	A	B	B
Agriculture	A	A	A	A	A	A	A

Source: City of Lake Forest General Plan, Safety and Noise Element (June 21, 1994).

KEY:

Zone A. Normally Acceptable—Specified land use is satisfactory, based on the assumption that any buildings involved are of normal conventional construction without any special noise insulation requirements.

Zone B. Conditionally Acceptable—New construction or development should be undertaken only after detailed analysis of noise reduction requirement is made and needed noise insulation features in the design are determined. Conventional construction, with closed windows and fresh air supply systems or air-conditioning, will normally suffice.

Zone C. Normally Unacceptable—New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of noise reduction requirements must be made and needed noise insulation features included in the design.

Zone D. Clearly Unacceptable—New construction should generally not be undertaken.

dBA = A-weighted decibels

Table E: Interior and Exterior Noise Standards

Land Use	Noise Standards	
	Interior[1]	Exterior
Residential: Single-Family, Multifamily, Duplex, Mobile Home	45 dBA CNEL	65 dBA CNEL[2]
Residential: Transient Lodging, Hotels, Motels, Nursing Homes, Hospitals	45 dBA CNEL	65 dBA CNEL
Private Offices, Church Sanctuaries, Libraries, Board Rooms, Conference Rooms, Theaters, Auditoriums, Concert Halls, Meeting Halls, etc.	45 dBA $L_{eq}(12)$[3]	—
Schools	45 dBA $L_{eq}(12)$	67 dBA $L_{eq}(12)$[4]
General Offices, Reception, Clerical, etc.	50 dBA $L_{eq}(12)$	—
Bank Lobby, Retail Store, Restaurant, Typing Pool, etc.	55 dBA $L_{eq}(12)$	—
Manufacturing, Kitchen, Warehousing, etc.	65 dBA $L_{eq}(12)$	—
Park, Playgrounds	—	65 dBA CNEL
Golf Courses, Outdoor Spectator Sports, Amusement Parks	—	70 dBA CNEL

Source: City of Lake Forest (July 11, 1995).

1 Noise standard with windows closed. Mechanical ventilation shall be provided per Uniform Building Code requirements to provide a habitable environment. Indoor environment excludes bathrooms, toilets, closets, and corridors.

2 Outdoor environment limited to rear yard of single-family homes, multifamily patios and balconies (with a depth of 6 ft or more), and common recreation areas.

3 Religious institutions (churches, temples, and other places of worship) of a small size (occupancy of 100 persons or less) may occupy existing buildings within areas of exterior noise levels. ranging from 65 to 75 dBA CNEL without providing additional noise insulation for the building.

4 Outdoor environment limited to playground areas, picnic areas, and other areas of frequent human use.

CNEL = Community Noise Equivalent Level
dBA = A-weighted decibels
$L_{eq}(12)$ = the A-weighted equivalent sound level averaged over a 12-hour period (usually the hours of operation).

Noise Control Ordinance. The City's Municipal Code, Chapter 11.16, Noise Control, specifies that noise resulting from construction activities are generally exempted from provisions of the Noise Ordinance except for the periods of time between 8:00 p.m. and 7:00 a.m. the following day from Monday through Saturday, and on Sundays and federal holidays. Construction noise during the allowed construction time periods is exempt from the noise level provisions in the Noise Control Ordinance.

The Noise Control Ordinance identifies that maximum permissible exterior ambient noise level for residential uses shall be no greater than 55 dBA between 7:00 a.m. and 10:00 p.m. and no greater than 50 dBA between 10:00 p.m. and 7:00 a.m. Maximum permissible interior ambient noise level for residential uses shall be no greater than 55 dBA between 7:00 a.m. and 10:00 p.m. and no greater than 45 dBA between 10:00 p.m. and 7:00 a.m.

The permitted exterior ambient noise level shall not be exceeded for more than 30 minutes in any hour. The exterior ambient noise level plus 5 dBA shall not be exceeded for a cumulative period of more than 15 minutes in any hour; or the exterior ambient noise level plus 10 dBA shall not be exceeded for a cumulative period of more than 5 minutes in any hour; or the exterior ambient noise level plus 15 dBA shall not be exceeded for more than 1 minute in any hour; or the exterior ambient noise level plus 20 dBA shall not be exceeded for any period of time (i.e., 75 and 70 dBA L_{max} during

daytime and nighttime, respectively). If the ambient noise level exceeds any of the first four noise limit categories above, the cumulative period applicable to such category shall be increased to reflect such ambient noise level. If the ambient noise level exceeds the fifth noise limit category, the maximum allowable noise level under such category shall be increased to reflect the maximum ambient noise level.

The permitted interior ambient noise level shall not be exceeded for more than five minutes in any hour; or the interior ambient noise level plus 5 dBA shall not be exceeded for a cumulative period of more than one minute in any hour; or the interior ambient noise level plus 10 dBA shall not be exceeded for any period of time (i.e., 65 and 55 dBA L_{max} during daytime and nighttime, respectively). If the ambient noise level exceeds either of the first two noise limit categories above, the cumulative period applicable to such category shall be increased to reflect such ambient noise level. If the ambient noise level exceeds the third noise limit category, the maximum allowable noise level under such category shall be increased to reflect the maximum ambient noise level.

2.4 Thresholds of Significance

Traffic Noise. A proposed project would normally have a significant off-site traffic noise impact if both of the following criteria are met:

Long-term project traffic will cause a noise level increase of 3 dBA or more on a roadway segment adjacent to a noise-sensitive land use in the project vicinity. Noise-sensitive land uses include the following: residential (single-family, multifamily, duplex, mobile home); transient lodging (e.g., hotels, motels); nursing homes; hospitals; parks, playgrounds, and recreation areas; and schools. The resulting “future with project” noise level exceeds the noise standard for sensitive land uses as identified in the City of Lake Forest General Plan (refer to Table E above).

Stationary Noise. The Noise Ordinance for the City of Lake Forest set limits on the level and duration of time a stationary noise source may impact a residential area. The determination that a project has the potential to exceed the City’s established noise limits is typically based on a noise technical report prepared by a qualified acoustical consultant. The project would normally have a significant noise impact if it would:

Exceed the stationary-source noise criteria for the City of Lake Forest as described in the City of Lake Forest Noise Ordinance.

3.0 IMPACTS AND MITIGATION MEASURES

3.1 Short-Term Construction-Related Impacts

Construction-related noise impacts from the proposed project would not be considered adverse; in addition, compliance with the City’s construction hours requirement would reduce the impact to a less than significant level.

Short-term noise impacts would be associated with excavation, grading, and erecting of buildings on site during construction of the proposed project. Construction-related short-term noise levels would be higher than existing ambient noise levels in the project area today, but would no longer occur once construction of the project is completed.

Two types of short-term noise impacts could occur during the construction of the proposed project. First, construction crew commutes and the transport of construction equipment and materials to the site for the proposed project would incrementally increase noise levels on access roads leading to the site. Although there would be a relatively high single-event noise exposure potential causing intermittent noise nuisance (passing trucks at 50 ft would generate up to a maximum of 87 dBA), the effect on longer term (hourly or daily) ambient noise levels would be small. Therefore, short-term construction-related impacts associated with worker commute and equipment transport to the project site would be less than significant.

The second type of short-term noise impact is related to noise generated during excavation, grading, and building erection on the project site. Construction is completed in discrete steps, each of which has its own mix of equipment, and consequently, its own noise characteristics. These various sequential phases would change the character of the noise generated on the site, and therefore, the noise levels surrounding the site as construction progresses. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction-related noise ranges to be categorized by work phase. Table F lists typical construction equipment noise levels recommended for noise impact assessments, based on a distance of 50 ft between the equipment and a noise receptor, taken from the FHWA Roadway Construction Noise Model (RCNM; *FHWA Highway Construction Noise Handbook,* August 2006).

Typical noise levels range up to 90 dBA L_{max} at 50 ft during the noisiest construction phases. The site preparation phase, which includes excavation and grading of the site, tends to generate the highest noise levels because the noisiest construction equipment is earthmoving equipment. Earthmoving equipment includes excavating machinery such as backfillers, bulldozers, draglines, and front loaders. Earthmoving and compacting equipment includes compactors, scrapers, and graders. Typical operating cycles for these types of construction equipment may involve 1 or 2 minutes of full-power operation followed by three or four minutes at lower power settings.

Construction of the proposed project is expected to require the use of earthmovers, bulldozers, and water and pickup trucks. This equipment would be used on the project site. Based on the information in Table F, the maximum noise level generated by each scraper on the proposed project site is assumed to be 84 dBA L_{max} at 50 ft from the scraper. Each bulldozer would also generate 82 dBA L_{max} at 50 ft. The maximum noise level generated by water and pickup trucks is approximately 75 dBA L_{max} at 50 ft from these vehicles. Each doubling of the sound sources with equal strength increases the noise level by 3 dBA. Assuming that each piece of construction equipment operates at some distance from the other equipment, the worst-case combined noise level during this phase of construction would be 91 dBA L_{max} at a distance of 50 ft from the active construction area.

There are no existing residences immediately adjacent to the project site. The closest residential uses are located approximately 1,500 ft to the south/southeast and will receive more than 30 dBA in noise attenuation from distance divergence and terrain shielding. However, based on the project's proposed phasing, residences in the first few phases may be exposed to noise from building construction in later

Table F: RCNM Default Noise Emission Reference Levels and Usage Factors

Equipment Description	Impact Device?	Acoustical Usage Factor	Spec. 721.560 L_{max} at 50 ft (dBA, slow)	Actual Measured L_{max} at 50 ft (dBA, slow)	Number of Actual Data Samples (Count)
All other Equipment > 5 HP	No	50	85	N/A	0
Backhoe	No	40	80	78	372
Blasting	Yes	N/A	94	N/A	0
Boring Jack Power Unit	No	50	80	83	1
Chainsaw	No	20	85	84	46
Clam Shovel (dropping)	Yes	20	93	87	4
Compactor (ground)	No	20	80	83	57
Compressor (air)	No	40	80	78	18
Concrete Mixer Truck	No	40	85	79	40
Concrete Saw	No	20	90	90	55
Crane	No	16	85	81	405
Dozer	No	40	85	82	55
Dump Truck	No	40	84	76	31
Excavator	No	40	85	81	170
Flatbed Truck	No	40	84	74	4
Front-End Loader	No	40	80	79	96
Generator	No	50	82	81	19
Generator (< 25 kVA, VMS Signs)	No	50	70	73	74
Grader	No	40	85	N/A	0
Jackhammer	Yes	20	85	89	133
Paver	No	50	85	77	9
Pickup Truck	No	40	55	75	1
Pneumatic Tools	No	50	85	85	90
Pumps	No	50	77	81	17
Rock Drill	No	20	85	81	3
Roller	No	20	85	80	16
Scraper	No	40	85	84	12
Shears (on backhoe)	No	40	85	96	5
Soil Mix Drill Rig	No	50	80	N/A	0
Tractor	No	40	84	N/A	0
Vacuum Excavator (Vac-Truck)	No	40	85	85	149
Vacuum Street Sweeper	No	10	80	82	19
Vibratory Concrete Mixer	No	20	80	80	1
Vibratory Pile Driver	No	20	95	101	44
Warning Horn	No	5	85	83	12
Welder/Torch	No	40	73	74	5

Source: FHWA *Highway Construction Noise Handbook* (August 2006).

dBA = A-weighted decibels
ft = foot/feet
ft-lb/blow = foot-pounds per blow
HP = horsepower
kVA = kilovolt-ampere(s)
L_{max} = maximum instantaneous noise level
N/A = Not Applicable
Spec. = Specification
VMS = variable message sign

phases. The project will be required to comply with the construction hours specified in the City's Noise Ordinance, which states that construction activities are generally prohibited between 8:00 p.m. and 7:00 a.m. the following day from Monday through Saturday, and no construction is permitted on Sundays and federal holidays. As construction would not occur except during the times permitted in the Noise Ordinance, and as Section 11.16.020 of the Municipal Code allows construction noise in excess of standards to occur between these hours, the project would not violate established standards and would be less than significant.

3.2 Long-Term Traffic Noise Impacts

Project-related long-term vehicular trip increases are anticipated to be small when distributed to adjacent street segments. The proposed on-site residential uses would be directly adjacent to Portola Parkway, Rancho Parkway, and SR-241; would be potentially exposed to traffic noise levels exceeding the exterior noise standard of 65 dBA CNEL; and/or would potentially exceed the interior noise standard of 45 dBA CNEL from exterior noise sources. Mitigation measures would be required.

The FHWA highway traffic noise prediction model (FHWA RD-77-108) was used to evaluate highway traffic-related noise conditions along the roadway segments in the project vicinity. The typical vehicle mix for Southern California was used.

Table G provides the traffic noise levels along the roadways adjacent to the project site under the existing with project traffic conditions. Tables H and I provide the traffic noise levels along the roadways adjacent to the project site under the opening year (2015) without and with project traffic conditions. Tables J and K provide the traffic noise levels along the roadways adjacent to the project site under the cumulative (2030) without and with project traffic conditions. These noise levels represent the worst- case scenario, which assumes that no shielding is provided between the traffic and the location where the noise contours are drawn. The specific assumptions used in developing these noise levels and model printouts are provided in Appendix A.

Off-Site Traffic Noise Impacts. A doubling of the traffic volume is needed for a 3 dB increase in traffic noise. Tables G, I, and K show the traffic noise levels for the with project scenario for the existing, 2015, and 2030 conditions, respectively. The project-related traffic noise level increase would be 0.4 dBA or less for the existing and opening year (2015) with project conditions. For the cumulative (2030) condition, the project-related traffic noise level would be lower than in the no project scenario, where a commercial project would be constructed on the project site in place of the project. The project-related traffic noise level decrease along roadway segments in the project vicinity would be up to 1.2 dBA (along Rancho Parkway between Lake Forest Drive and the Sports Park). Because there are no noise-sensitive land uses in the project vicinity that would be exposed to traffic noise levels exceeding the City's noise standards or a more than 3 dBA increase over the no project scenario, as shown in Tables G, I, and K, no significant off-site traffic noise impacts would occur and no mitigation measures would be required for off-site land uses.

Table G: Existing with Project Traffic Noise Levels

Roadway Segment	ADT	Centerline to 70 CNEL (ft)	Centerline to 65 CNEL (ft)	Centerline to 60 CNEL (ft)	CNEL (dBA) 50 ft from Centerline of Outermost Lane	Increase CNEL (dBA) 50 ft from Centerline of Outermost Lane
Rancho Pkwy. west of Lake Forest Dr.	8,300	< 50	82	170	65.7	0.0
Rancho Pkwy. between Lake Forest Dr. and Sports Park	9,600	< 50	89	187	66.4	0.4
Rancho Parkway between Sports Park and Portola Pkwy.	8,700	< 50	84	175	65.9	0.3
Lake Forest Dr. north of Rancho Pkwy.	16,300	62	125	265	68.7	0.1
Lake Forest Dr. south of Rancho Pkwy.	18,900	67	137	292	69.3	0.1
Portola Pkwy. north of Rancho Pkwy.	24,200	78	161	344	70.4	0.1
Portola Pkwy. south of Rancho Pkwy.	31,000	91	190	406	71.4	0.0
SR-241 toll road	39,900	190	403	866	75.7	0.0

Source: LSA Associates, Inc. (October 2013).
Notes: Traffic noise within 50 ft of the roadway centerline should be evaluated with site-specific information.
Modeled using the "Soft" setting and the Orange County default fleet percentages on Rancho Parkway, and Caltrans data for the SR-241 toll road.

ADT = average daily traffic
Caltrans = California Department of Transportation
CNEL = Community Noise Equivalent Level
dBA = A-weighted decibels
ft = foot/feet
SR-241 = State Route 241

Table H: Opening Year (2015) without Project Traffic Noise Levels

Roadway Segment	ADT	Centerline to 70 CNEL (ft)	Centerline to 65 CNEL (ft)	Centerline to 60 CNEL (ft)	CNEL (dBA) 50 ft from Centerline of Outermost Lane
Rancho Pkwy. west of Lake Forest Dr.	12,000	< 50	103	217	67.3
Rancho Pkwy. between Lake Forest Dr. and Sports Park	12,000	< 50	103	217	67.3
Rancho Parkway between Sports Park and Portola Pkwy.	12,000	< 50	103	217	67.3
Lake Forest Dr. north of Rancho Pkwy.	22,700	75	155	330	70.1
Lake Forest Dr. south of Rancho Pkwy.	29,900	89	185	396	71.3
Portola Pkwy. north of Rancho Pkwy.	31,400	91	191	409	71.5
Portola Pkwy. south of Rancho Pkwy.	42,600	111	234	502	72.8
SR-241 toll road	53,800	230	491	1,056	77.0

Source: LSA Associates, Inc. (October 2013).
Note: Traffic noise within 50 ft of the roadway centerline should be evaluated with site-specific information.
Modeled using the "Soft" setting and the Orange County default fleet percentages on Rancho Parkway and Caltrans data for the SR-241 toll road extrapolated using the same growth rate as the traffic study developed for Rancho Parkway.

ADT = average daily traffic
Caltrans = California Department of Transportation
CNEL = Community Noise Equivalent Level
dBA = A-weighted decibels
ft = foot/feet
SR-241 = State Route 241

Table I: Opening Year (2015) with Project Traffic Noise Levels

Roadway Segment	ADT	Centerline to 70 CNEL (ft)	Centerline to 65 CNEL (ft)	Centerline to 60 CNEL (ft)	CNEL (dBA) 50 ft from Centerline of Outermost Lane	Increase CNEL (dBA) 50 ft from Centerline of Outermost Lane
Rancho Parkway west of Lake Forest Dr.	12,000	< 50	103	217	67.3	0.0
Rancho Parkway between Lake Forest Dr. and Sports Park	12,700	< 50	107	225	67.6	0.3
Rancho Parkway between Sports Park and Portola Pkwy.	12,600	< 50	106	224	67.5	0.2
Lake Forest Dr. north of Rancho Pkwy	23,000	76	156	333	70.1	0.0
Lake Forest Dr. south of Rancho Pkwy	30,300	89	187	400	71.3	0.0
Portola Pkwy north of Rancho Pkwy	32,300	93	195	417	71.6	0.1
Portola Pkwy south of Rancho Pkwy	43,300	112	236	507	72.9	0.1
SR-241 toll road	53,800	230	491	1,056	77.0	0.0

Source: LSA Associates, Inc. (October 2013).
Note: Traffic noise within 50 ft of the roadway centerline should be evaluated with site-specific information.
Modeled using the "Soft" setting and the Orange County default fleet percentages on Rancho Parkway, and Caltrans data for the SR-241 toll road extrapolated using the same growth rate as the traffic study developed for Rancho Parkway.

ADT = average daily traffic
Caltrans = California Department of Transportation
CNEL = Community Noise Equivalent Level
dBA = A-weighted decibels
ft = foot/feet
SR-241 = State Route 241

Table J: Future Year (2030) without Project Traffic Noise Levels

Roadway Segment	ADT	Centerline to 70 CNEL (ft)	Centerline to 65 CNEL (ft)	Centerline to 60 CNEL (ft)	CNEL (dBA) 50 ft from Centerline of Outermost Lane
Rancho Pkwy. west of Lake Forest Dr.	20,000	69	143	304	69.5
Rancho Pkwy. between Lake Forest Dr. and Sports Park	27,000	83	173	370	70.8
Rancho Pkwy. between Sports Park and Portola Pkwy.	27,000	83	173	370	70.8
Lake Forest Dr. north of Rancho Pkwy.	27,600	84	176	376	70.9
Lake Forest Dr. south of Rancho Pkwy.	36,800	101	212	455	72.2
Portola Pkwy. north of Rancho Pkwy.	33,900	96	201	431	71.8
Portola Pkwy. south of Rancho Pkwy.	51,500	125	265	569	73.6
SR-241 toll road	121,100	392	843	1,814	80.5

Source: LSA Associates, Inc. (October 2013).
Notes: Traffic noise within 50 ft of the roadway centerline should be evaluated with site-specific information.
Modeled using the "Soft" setting and the Orange County default fleet percentages on Rancho Parkway, and Caltrans data for the SR-241 toll road extrapolated using the same growth rate as the traffic study developed for Rancho Parkway.

ADT = average daily traffic
Caltrans = California Department of Transportation
CNEL = Community Noise Equivalent Level
dBA = A-weighted decibels
ft = foot/feet
SR-241 = State Route 241

Table K: Future Year (2030) with Project Traffic Noise Levels

Roadway Segment	ADT	Centerline to 70 CNEL (ft)	Centerline to 65 CNEL (ft)	Centerline to 60 CNEL (ft)	CNEL (dBA) 50 ft from Centerline of Outermost Lane	Increase CNEL (dBA) 50 ft from Centerline of Outermost Lane
Rancho Pkwy. west of Lake Forest Dr.	19,400	68	140	298	69.4	-0.1
Rancho Pkwy. between Lake Forest Dr. and Sports Park	20,300	70	144	307	69.6	-1.2
Rancho Pkwy. between Sports Park and Portola Pkwy.	21,500	73	149	318	69.9	-0.9
Lake Forest Dr. north of Rancho Pkwy.	25,600	81	167	358	70.6	-0.3
Lake Forest Dr. south of Rancho Pkwy.	33,800	96	201	430	71.8	-0.4
Portola Pkwy. north of Rancho Pkwy.	32,900	94	197	422	71.7	-0.1
Portola Pkwy. south of Rancho Pkwy.	48,600	120	255	547	73.4	-0.2
SR-241 toll road	121,100	392	843	1,814	80.5	0.0

Source: LSA Associates, Inc. (October 2013).
Notes: Traffic noise within 50 ft of the roadway centerline should be evaluated with site-specific information.
Modeled using the "Soft" setting and the Orange County default fleet percentages on Rancho Parkway, and Caltrans data for the SR-241 toll road extrapolated using the same growth rate as the traffic study developed for Rancho Parkway.

ADT = average daily traffic
Caltrans = California Department of Transportation
CNEL = Community Noise Equivalent Level
dBA = A-weighted decibels
ft = foot/feet
SR-241 = State Route 241

On-Site Traffic Noise Impacts. Table K shows that several roadway segments that would be directly adjacent to the project site would have the 65 dBA CNEL noise contour extending to beyond the roadway right-of-way. Therefore, outdoor living areas associated with the proposed residential uses would be within the 65 dBA CNEL noise impact zone from these roadway segments in the project area:

- Portola Parkway within 197 ft of the roadway centerline;
- Rancho Parkway with 149 ft of the roadway centerline; and
- SR-241 within 843 ft of the centerline.

Based on the preliminary grading plan for the project site (prepared by Hunsaker & Associates, November 14, 2013), there are variations in the elevation for the proposed on-site residential uses and major roadways (Portola Parkway, Rancho Parkway, and SR-241) surrounding the project site. The elevation difference between the roads and the proposed on-site residential units would provide noise shielding from the embankment of the higher side. The following summarizes the elevation differences between these major roadways and the residential units in different phases and potential noise attenuation from the elevation differences:

- Sites along Portola Parkway vary from 20 ft below the road (12 dBA or more in noise attenuation) in the north to 20 ft above the road (10 dBA or more in noise reduction) in the south.
- Sites along Rancho Parkway vary from 3 ft above the road (2 dBA in noise attenuation) in the west to 20 ft above the road (10 dBA or more in noise attenuation) in the east.

- Sites along SR-241 vary from 7 ft below the road (5 dBA in noise attenuation) in the west to 65 ft below the road (12 dBA or more in noise attenuation) in the east, with an earthen berm that runs from east to west from 35 ft below the SR-241 to level with the toll road.

Based on the project's conceptual site plan (Bassenian/Lagoni Architecture Planning Interiors, September 3, 2013), there are single-family dwelling units proposed along these three roadways. Along Portola Parkway, frontline home lots are approximately 140 ft (67.4 dBA CNEL without shielding from elevation difference) to 410 ft (60.2 dBA CNEL without shielding from elevation difference) from the roadway centerline. Along Rancho Parkway, there are single-family residential lots that would be 60 ft (71.3 dBA CNEL without shielding from elevation difference) to 80 ft (69.4 dBA CNEL without shielding from elevation difference) from the roadway centerline. Along SR-241, there are single-family residential lots that would be 130 ft (77.2 dBA CNEL without shielding from elevation difference) to 320 ft (71.3 dBA CNEL without shielding from elevation difference) from the toll road centerline.

These residential units along the three roadways would be potentially exposed to traffic noise exceeding the City's 65 dBA CNEL exterior noise standard for the outdoor living area without shielding provided by the elevation difference between the road and these residential units.

With the potential noise attenuation from elevation difference included, traffic noise would be reduced at the following on-site residential areas:

- The lots along Portola Parkway that are 20 ft below (-12 dBA or more) to 20 ft above (-10 dBA or more) the road would be exposed to traffic noise levels ranging from 48.2 to 57.4 dBA CNEL.
- The lots along Rancho Parkway that are 3 ft above the road (-2 dBA) to 20 ft above (-10 dBA or more) the road would be exposed to traffic noise levels reaching 59.4 dBA CNEL. Those that are at the west end would be potentially exposed to traffic noise levels reaching 69.3 dBA CNEL in the middle and to the west.
- The lots along SR-241 that are 7 ft below (-5 dBA or more) the toll road would be exposed to traffic noise levels reaching 72.2 dBA CNEL in the west. Those that are 65 ft below the toll road (-12 dBA) would be exposed to traffic noise levels reaching 59.7 dBA CNEL in the east.

Based on the above analysis, the following mitigation measures are recommended for the residential units within the noise impact zones along the three roadways:

- **Portola Parkway:** For homes on pads with elevations more than 20 ft below or above the elevation of the road, no mitigation measure is required for outdoor living areas. Those dwelling units that are within 5 ft of the roadway elevation require a noise barrier with a minimum height of 5 ft around the perimeter of the outdoor living areas. Second-floor balcony, if any, would receive less noise attenuation, and mitigation measures such as noise barriers with 5 ft minimum height would be required along the perimeter of the outdoor living areas.
- **Rancho Parkway:** For homes on pads with elevations within 4 ft of the road elevation, a 5 ft high sound barrier along the perimeter of the backyard or patio and a 5 ft high sound barrier along the perimeter of any second-floor balcony would be required for the outdoor living areas. A sound barrier constructed along the project boundary along Rancho Parkway with minimum

height of 5 ft above ground could replace the above recommended sound walls along the perimeter of the backyard/patio.

- **SR-241:** For homes along SR-214, a 10 ft high sound barrier along the property line along SR-241 for home lots within 10 ft of the SR-241 elevation at the west end, stepping down to 8 ft high sound barrier for home lots that are between 10 to 15 ft of the SR-241 elevation, and stepping down to 6 ft high for home lots that are between 15 ft and 20 ft below the SR-241 in the middle. For home lots that are more than 20 ft below the SR-241, no sound wall would be required.

The proposed noise barriers must consist of materials with a minimum density of 3.5 pounds per square foot or a combination of materials that meet this requirement. Such barrier materials include, but are not limited to, the following: ¾-inch plywood, ¼-inch tempered glass, ¼-inch laminated glass, ¼-inch Plexiglas, or masonry.

With the 24 dBA exterior-to-interior noise attenuation provided by the standard building shell in warm climate when windows are closed (Protective Noise Levels, Environmental Protection Agency [EPA] 550/9-79-100, November 1978), the proposed residential structures within the 69 dBA CNEL noise impact zone from these roadway segments in the project area would need additional building facade upgrades:

- **SR-241:** Windows with Sound Transmission Class (STC)-28 or higher for ground-floor units and windows with STC-32 or higher for second-floor units for homes in the middle and to the west.
- **Rancho Parkway:** Windows with STC-28 or higher for ground-floor units and windows with STC-30 or higher for second-floor units for homes in the middle and to the west end.

Proposed residential units along Portola Parkway would be outside of the 69 dBA CNEL impact zone with implementation of the noise barriers. Therefore, no building facade upgrades, such as windows with STC ratings higher than standard building construction provides, are required for these interior noise-sensitive rooms (bedrooms and living room).

Mechanical ventilation, such as air-conditioning, would be required for noise-sensitive rooms that are exposed to traffic noise exceeding 57 dBA CNEL, due to only 12 dBA exterior-to-interior noise attenuation provided by standard building shell in warm climate when windows are open (Protective Noise Levels, EPA 550/9-79-100, November 1978). Residential units within the following areas without natural or manmade structures to shield the traffic noise would be exposed to traffic noise exceeding 57 dBA CNEL from these roadway segments in the project area:

- Portola Parkway;
- Rancho Parkway; and
- SR-241.

The recreational area proposed on the project site is shielded by the residential structures and is not directly exposed to major streets in the project area. Therefore, no significant traffic noise impacts would be expected to affect the recreational area.

3.3 Long-Term Stationary-Source Impacts

As noise spreads from a source it loses energy, so that the farther away the noise receiver is from the noise source, the lower the perceived noise level would be. Geometric spreading causes the sound level to attenuate or be reduced, resulting in a 6 dBA reduction in the noise level for each doubling of distance from a single point source of noise, such as an idling truck, to the noise-sensitive receptor of concern.

The proposed on-site residential uses would be potentially exposed to noise from truck delivery and loading/unloading activities, as well as other activities at the parking lot associated with existing commercial/industrial uses to the west and Sports Park activities south of the project site. These activities are potential point sources of noise that could affect noise-sensitive receptors adjacent to the loading areas or Sports Park, such as proposed residential uses on the project site. Mitigation measures may be required to comply with the City's noise standards.

The existing commercial/industrial uses to the west have the nearest loading/unloading areas, located approximately 200 ft from the project boundary. Noise associated with loading/unloading activities at these commercial/industrial uses would potentially affect on-site residences if they are located near the project boundary. Other off-site, noise-producing activities may include outdoor air-conditioning units, parking, traffic, and pedestrian activity within the parking lot of the commercial/industrial uses. Most of the events are intermittent in nature and usually of a very short duration, lasting a few seconds. The combination of the intermittent activities, even over the course of a day, does not amount to a significant amount of time.

Truck Delivery and Loading/Unloading. Delivery trucks (including Federal Express, United Parcel Service, and other trucks) and loading/unloading (including forklift) operations for the existing commercial/industrial uses would result in maximum noise readings similar to loading and unloading activities for other projects, which generate a noise level of 75 dBA L_{max} at 50 ft and are used in this analysis. Based on the above discussion, loading/unloading noise would be reduced by the 200 ft distance divergence to 63 dBA L_{max} or lower at ground level of the nearest on-site location for residential uses. This range of maximum noise levels is lower than the City's exterior noise standards of 75 dBA L_{max} during the day (7:00 a.m.–10:00 p.m.) and 65 dBA L_{max} during the night (10:00 p.m.–7:00 a.m.). Since there would not be nighttime activities at the adjacent commercial/industrial uses, the nighttime maximum noise level standard is not expected to be violated.

Although typical truck unloading processes take an average of 15–20 minutes, this maximum noise level occurs in a much shorter period of time (i.e., just a few minutes). However, if the loading/unloading activities last for more than 15 minutes in any hour, the City's 60 dBA noise level exceeded 25 percent of the time (L_{25}) standard that is not to be exceeded for more than 15 minutes in any hour would be violated. Because the City's noise standard of 60 dBA that should not be exceeded for more than 15 minutes in any hour during the daytime hours would be potentially exceeded, mitigation measures, such as a sound barrier with a minimum height of 6 ft along the project boundary directly adjacent to the loading/unloading areas of the existing commercial/industrial uses would be required.

Parking Lot Activity. Representative parking activities, such as employees conversing and doors slamming, would generate approximately 60 dBA L_{max} at 50 ft. This level of noise is much lower than that of the truck delivery and loading/unloading activities. With the noise attenuation effect from the distance divergence, noise in the parking lot would be attenuated to below 48 dBA L_{max} and is not anticipated to be a significant noise issue with respect to residences proposed on the project site.

Sports Park. The proposed residential uses would be exposed to activities occurring at the Sports Park to the south of the project site. Major noise-generating activities, such as competitive sports games, would occur at the Sports Park. Therefore, significant stationary noise impacts would potentially occur with implementation of the proposed project. Mitigation measures would therefore be required.

During a sports event, spectators, players, and coaches would generate relatively loud noise. However, a single daytime or nighttime event, even with relatively high noise-generating activities—such as periodic whistles, loud talk, players yelling on the fields, and cheering, yelling, and applause from spectators—would not necessarily result in the CNEL exceeding the 65 dBA CNEL City noise standard for residential uses. For example, many areas adjacent to an airport or a freeway may experience high single event noise from overhead aircraft exceeding 85 dBA L_{max} or heavy-duty trucks exceeding 75 dBA L_{max}, but they may still be outside the 60 dBA CNEL noise contour from the airport or the freeway. A noisy event generating 70 dBA L_{max} and lasting for 1 hour may be averaged down to a much lower CNEL if sound levels during the remainder of the 24-hour period are 50 dBA or lower. The emphasis is that CNEL is a weighted, 24-hour average noise scale, not an instantaneous noise level denoted by a simple dBA reading. A single event at the Sports Park that generates an instantaneous noise level several times higher than the ambient or background noise level without that particular event does not necessarily represent a violation of the City's noise standard, as described in the General Plan, or the City's noise ordinance. As long as the CNEL levels identified in the City's General Plan and noise ordinance are not exceeded, no violation of the City's noise standard would occur. Furthermore, if the City's 75 dBA L_{max} maximum noise level during daytime hours is not exceeded, no significant "sudden noise" startling effect would occur.

Because no activity schedule is available for the neighboring Sports Park, for operational noise impact analysis, it is assumed that during a peak use day, there could be up to 94 people at one time at each of the sports field of the Sports Park for games or competition, including players, coaches and umpires, and spectators. Peak use days would occur only when use is maximized (e.g., during the summer months or on weekends) and when more games versus practices are occurring, resulting in more people in attendance. This means that for the Sports Park, which is assumed to include three sports fields adjacent to the project site, there could be up to 282 people present at the three closest playfields at one time. Therefore, as a worst-case scenario for this noise analysis, it is assumed that a total of 282 people (assuming half male and half female for spectators), including players and spectators, would be present at the same time at the Sports Park.

However, for a typical day, the following scenario is more likely to occur at each field of the proposed Sports Park: a total of 60 people at the three fields with all 60 people making noise at the same time, assuming that a weekday practice would consist of 15 people per team, including 12 players and 3 coaches. Some parents may choose to watch practice, making it a maximum of 20 people present per team. Because only one team practices on the field at a time, the three fields

adjacent to the project site would have a maximum of 60 people total for a typical weekday practice. The "typical day" scenario is included in this analysis because it is assumed that the Sports Park would not be fully used to its maximum capacity every day (e.g., on weekdays during the school year or during the winter months, and when practices as opposed to games are occurring, resulting in fewer people in attendance). This scenario reflects the more typical noise levels that residents would experience. Because male voice levels are higher than those of females, for a worst-case scenario, it is assumed that all 12 players and 3 coaches on a team are males. It is further assumed that among the participating parents, half of them are males and half of them are females. Therefore, out of the 60 people on the three fields, there will be 52 males and 8 females under the typical day scenario.

The *Handbook of Acoustical Measurements and Noise Control* (1991) lists average sound levels for different male and female vocal efforts (i.e., shouting/yelling, loud voice, and raised voice).[1] The average A-weighted vocal sound levels under quiet conditions for these three vocal categories include: 88 dBA for male shouting and 82 dBA for female shouting, 75 dBA for a male loud voice and 71 dBA for a female loud voice, and 65 dBA for a male raised voice and 62 dBA for a female raised voice. These are all maximum sound pressure levels (L_{max}) measured at 1 meter (m), or 3 ft, from the person in a free field.[2]

In acoustics, every doubling of an equal sound energy would result in a 3 dBA increase in combined noise level. Therefore, 2 males shouting at the same time (which assumes a worst-case scenario with combined voice levels reaching the peak noise level at the same time) would result in a noise level of 91 dBA at 1 m (3 ft); 4 males shouting would result in a noise level of 94 dBA; 8 males, 97 dBA; 16 males, 100 dBA; 32 males, 103 dBA; 47 males, 105 dBA; 40 males, 104 dBA; 64 males, 106 dBA; 94 males, 108 dBA; and 141 males, 109 dBA. Similarly, for females shouting, 2 would result in a noise level of 85 dBA at 3 ft; 4 females, 88 dBA; 8 females, 91 dBA; 16 females, 94 dBA; 32 females, 97 dBA; 39 females, 98 dBA; 47 females, 99 dBA; 64 females, 100 dBA; 94 females, 102 dBA, and 141 females, 96 dBA. These calculations demonstrate that as the number of people increases from 1 to 141, the peak noise level increases by 21 dBA. It should be noted that these calculations represent the worst-case scenario due to the fact that it is rarely possible for 141 people to simultaneously reach a peak vocal level. In addition, it is impossible to maintain a distance of 3 ft from all 141 people since each person is assumed to remain a point source.

Using the same methodology described above, 141 males speaking with a loud voice would result in an increase in noise level from 75 dBA (for one male) to 96 dBA at 3 ft, and 141 females would result in an increase in noise level from 71 dBA (for one female) to 92 dBA at 3 ft. For a raised voice, 141 males would result in a noise level of 86 dBA at 3 ft, and 141 females would result in a noise level of 83 dBA at 3 ft. The first two rows of Table L lists these different voice levels measured at 3 ft.

The following discussions evaluate the projected noise impacts from the Sports Park on the proposed on-site residences.

1 Harris, Cyril M., ed., 1991. *Handbook of Acoustical Measurements and Noise Control*, Third Edition.
2 Ibid.

Residences along Rancho Parkway. The shortest distance between the bleachers at the nearest proposed sports fields at the Sports Park and residences to the north along Rancho Parkway is approximately 350 ft. These residences would be at elevations similar to the completed sports fields.

Table L: Player and Spectator Noise at Residences along Rancho Parkway (dBA)

Number of People/Distance/ Time Duration	Shouting/Yelling		Loud Voice		Raised Voice	
	Male	Female	Male	Female	Male	Female
1 person at 3 ft (1 m), instant	88	82	75	71	65	62
141 people at 3 ft, instant	109	103	96	92	86	83
141 people at 350 ft, instant	68	62	55	51	45	42
188 people at 350 ft, instant	69		56.5		46.8	
188 people at 350 ft, L_{eq} for 2 hours[1]	58.9					
2-hour event 24-hour CNEL[2]	58.9					
4-hour event 24-hour CNEL[3]	59.2					
10-hour event 24-hour CNEL[3]	59.3					
City Standard[4]	< 65					

Source: LSA Associates, Inc. (November 2013).

[1] Assumes 10 minutes of shouting, 20 minutes of loud voices, and 90 minutes of raised voices.

[2] Assumes ambient noise of 60 dBA during the day and evening (7:00 a.m. to 10:00 p.m.) and 50 dBA during the night (10:00 p.m. to 7:00 a.m.) other than the 2-hour daytime or evening hours (7:00 a.m. to 10:00 p.m.) sports event.

[3] Assuming 3 hours of sports event occurring during evening hours (7 p.m. to 10 p.m.) as a worst case scenario.

[4] Normally acceptable for residential uses.

CNEL = Community Noise Equivalent Level
dBA = A-weighted decibels
ft = foot/feet
L_{eq} = equivalent continuous noise level
m = meter(s)

At a distance of 350 ft, the distance attenuation would provide approximately 41 dBA in noise reduction, compared to the noise level at 1 m (3 ft) from the point source(s). Therefore, the noise levels referenced above for 141 people shouting would be reduced to 68 dBA L_{max} for males and 62 dBA L_{max} for females. The noise level for 141 people speaking in loud voices would be reduced to 55 dBA L_{max} for males and 51 dBA L_{max} for females. The resulting noise levels for 141 people speaking in raised voices would be reduced to 45 dBA L_{max} for males and 42 dBA L_{max} for females. This analysis assumes that a total of 282 players and spectators consisting of 141 males and 141 females would be present during a scheduled sports event at the three closest fields at the Sports Park. The analysis assumes that over a 2-hour period, all 282 people would shout at the same time for a cumulative total of 10 minutes, which would generate a combined 69 dBA instantaneous noise level; speak in loud voices for a cumulative total of 20 minutes, which would generate a combined 56.5 dBA instantaneous noise level; and talk in raised voices for a cumulative total of 90 minutes, which would generate a combined 46.8 dBA instantaneous noise level. Table L shows that the L_{eq} at a distance of 350 ft would be 58.9 dBA L_{eq} during the 2-hour period. It is also noted that, under the worst-case scenario, if all 282 people shout or yell at the same time, the combined noise level would not exceed the City's daytime exterior noise standard of 75 dBA L_{max} for residential uses at the nearest residences. It would also not exceed the City's 70 dBA L_{max} nighttime exterior noise standard. Therefore, no noise mitigation is required.

To obtain a 24-hour weighted CNEL, 24 hourly L_{eq}s are required. In the area along Rancho Parkway, daytime and evening (7:00 a.m. to 10:00 p.m.) ambient noise is assumed to be 60 dBA, while nighttime (10:00 p.m. to 7 a.m.) ambient noise is assumed to be 50 dBA. Therefore, the noise generated by 282 players and spectators during a 2-hour sports event would result in a noise level of 58.9 dBA CNEL for an event occurring between 7:00 a.m. and 10:00 p.m.

Table L lists step by step the procedure by which these noise levels were calculated. It shows that a 2-hour sports event at the nearest three fields at the Sports Park with up to 282 players and spectators would potentially result in a noise level of 58.9 dBA CNEL at 350 ft. This noise level would not exceed the 65 dBA CNEL normally acceptable exterior noise standard for residential uses if the event occurs between the hours of 7:00 a.m. and 10:00 p.m. Because the Sports Park fields have a lighting curfew after 10:30 p.m., all sports events would stop after that time. Even if sports events at the Sports Park last all day (i.e., up to 10 hours with 3 hours during the evening hours) during daytime and evening hours with a similar number of players and spectators, the cumulative noise level at the residences on the north side of Rancho Parkway closest to the proposed sports fields would not exceed the City's exterior noise standard of 65 dBA CNEL for residential uses.

As for the more typical day scenario, the analysis assumes that a total of 60 players and spectators consisting of 52 males and 8 females could be present during a scheduled sports event at the closest three sports fields at the Sports Park. Noise levels associated with this more typical day scenario would be much lower than the peak-event noise analyzed above and would not result in any significant noise impacts to the proposed on-site residences.

Interior Noise Standard. The typical maximum allowable interior noise levels for residential uses are 45 dBA between 10:00 p.m. and 7:00 a.m. and 50 dBA between 7:00 a.m. and 10:00 p.m. Typical sound level reduction of buildings in a warm climate such as Southern California is 12 dBA with windows opened and 24 dBA with windows closed (Protective Noise Levels, EPA 550/9-79-100, November 1978). Interior noise levels at the residences nearest the commercial uses, attributable to loading/unloading activities from the off-site loading areas, would be reduced to 51 dBA L_{max} with windows open and to 39 dBA L_{max} with windows closed. Standard building construction for residential structures would be sufficient to meet the interior noise standard when air-conditioning, a form of mechanical ventilation, is provided to ensure that windows can remain closed for prolonged periods of time.

Heating, Ventilating, and Air-Conditioning Units. The proposed residential units would be equipped with heating, ventilating, and air-conditioning (HVAC) units. All residential HVAC units will be designed to meet the City's Municipal Code noise requirements.

3.4 Standard Conditions

The City of Lake Forest Opportunities Study Program Environmental Impact Report (EIR) included several Standard Conditions for Noise, as listed below, that will be applicable to the proposed project as well:

N1 Prior to the issuance of a grading permit, the applicant shall produce written evidence, or other evidence deemed reasonably acceptable by the Director of Development Services, that all construction vehicles or equipment, fixed or mobile, operated within 1,000 feet of any residential dwelling unit shall be equipped with properly operating and maintained mufflers.

N2 Grading and construction activities shall be prohibited between the hours of 7:00 p.m. and 7:00 a.m., Monday through Friday; 6:00 p.m. and 8:00 a.m., Saturday; and at any time on Sunday or a federal holiday.

N3 Prior to the issuance of building permits for each structure or tenant improvement other than a parking structure, the applicant shall submit a final acoustical report prepared to the satisfaction of the Director of Development Services. The report shall show that the development will be sound attenuated against present and projected noise levels, including roadway and railroad, to meet City interior and exterior noise standards. In order to demonstrate that all mitigation measures have been incorporated into the project, the report shall be accompanied by a list identifying the sheet(s) of the building plans that include the approved mitigation measures.

3.5 Mitigation Measures

The City of Lake Forest Opportunities Study Program EIR included several mitigation measures for noise, as listed below, that will be applicable to the proposed project:

NM 3.10-1 A condition of approval shall be placed on all Site Development Permit approvals for site-specific developments, which states: Construction staging areas and operation of earth moving equipment on a project site shall be located more than 25 feet away from sensitive receptors (such as residences, schools, hospitals). If equipment will be operated within 25 feet of any sensitive receptor, the applicant shall prepare a construction plan which quantifies the anticipated vibration levels associated with the construction (in VdB) and the length of time the construction is to occur, and documents efforts to minimize impacts associated with groundborne vibration.

NM 3.10-2 Prior to the issuance of a Site Development Permit for site-specific development within the project area, the City shall conduct a tiered site-specific analysis under CEQA to determine whether the individual project will expose sensitive receptors to either a substantial increase in ambient noise resulting from increased traffic volumes generated by that project or excessive groundborne vibration or groundborne noise levels. Where significant impacts are identified, appropriate mitigation shall be required.

NM 3.10-3 A condition of approval shall be placed on all Site Development Permit approvals for site-specific development, which states: Prior to issuance of a building permit, the applicant shall submit plans for shielding of all HVAC equipment to provide noise attenuation that will reduce noise from HVAC systems to 65 dBA or less when measured at 50 feet from the noise source.

Mitigation Measures NM 3.10-1 and NM 3.10-3 shall be carried forward from the City's Opportunities Study Program EIR. As required by NM 3.10-2, this analysis provides the tiered site-specific analysis for the proposed project, and has identified the following site-specific mitigation measures.

Construction Impacts. Construction of the proposed project would potentially result in relatively high noise levels at the closest residences. In compliance with Mitigation Measure 3.10-2 to prepare a tiered, site-specific noise analysis to evaluate whether the project generates a substantial increase in ambient noise resulting from short-term construction noise, the following mitigation measures are required, and which, if implemented, will avoid exceedances of the City's noise standards and thresholds of significance. The following measures would reduce short-term construction-related noise impacts resulting from the proposed project:

- The project contractor shall place all stationary construction equipment so that emitted noise is directed away from sensitive receptors nearest the project site.
- The construction contractor shall locate equipment staging in areas that will create the greatest distance practical between construction-related noise sources and noise-sensitive receptors such as residential uses nearest the project site during all project construction.
- The construction contractor shall obtain the City's approval for its haul plan, with the planned haul truck routes avoiding residential areas to the extent feasible.
- The construction contractor shall schedule the timing and/or sequence so that the noisiest construction operations do not occur during sensitive times of the day (i.e., early morning hours between 7:00 a.m. and 8:00 a.m. or late afternoon hours between 6:00 p.m. and 8:00 p.m.)

Traffic Noise Impacts. In compliance with Mitigation Measure 3.10-2 to prepare a tiered, site-specific noise analysis, evaluate whether the project generates a substantial increase in ambient noise resulting from increased traffic volumes, and identify appropriate mitigation, the following mitigation measures are required which, if implemented, will avoid exceedances of the City's noise standards and thresholds of significance:

Sound Barriers. Outdoor living areas, such as backyards, patios, or balconies, within the following impact areas are required to be protected by stand-alone sound barriers:

- **Portola Parkway:** For homes on pads with elevations more than 20 ft below or above the elevation of the road, no mitigation measures would be required for outdoor living areas. These dwelling units that are within 5 ft of the roadway elevation require a noise barrier with a minimum height of 5 ft around the perimeter of the outdoor living areas. Mitigation measures such as noise barriers with 5 ft minimum height are required for any second-floor balcony along the perimeter of the outdoor living areas.
- **Rancho Parkway:** For homes on pads with elevations within 4 ft of the road elevation, a 5 ft high sound barrier along the perimeter of backyard or patio and a 5 ft high sound barrier along the perimeter of any second-floor balcony would be required. A sound barrier

constructed along the project boundary along Rancho Parkway with a minimum height of 5 ft above ground could replace the above recommended sound walls along the perimeter of the backyard/patio.

- **SR-241:** For homes along SR-214, a 10 ft high sound barrier along the property line along SR-241 for home lots within 10 ft of the SR-241 elevation at the west end, stepping down to 8 ft high sound barrier for home lots that are between 10 to 15 ft of the SR-241 elevation, and stepping down to 6 ft high for home lots that are between 15 ft and 20 ft below the SR-241 in the middle. For home lots that are more than 20 ft below the SR-241, no sound wall would be required.

The proposed noise barriers must consist of materials with a minimum density of 3.5 pounds per square foot or combination of materials that meet this requirement. Such barrier materials include, but are not limited to, the following: ¾-inch plywood, ¼-inch tempered glass, ¼-inch laminated glass, ¼-inch Plexiglas, or masonry.

Building Facade Upgrades. Noise-sensitive rooms, such as bedrooms and living rooms, within the following impact areas are required to have building facade upgrades:

- **SR-241:** Windows with STC-28 or higher for ground-floor units and windows with STC-32 or higher for second-floor units for homes in the middle and to the west end.
- **Rancho Parkway:** Windows with STC-28 or higher for ground-floor units and windows with STC-30 or higher for second-floor units for homes in the middle and to the west end.

Mechanical Ventilation/Air-Conditioning. Noise-sensitive rooms, such as bedrooms and living rooms, within the following impact areas are required to be equipped with air-conditioning, a form of mechanical ventilation:

- Portola Parkway;
- Rancho Parkway; and
- SR-241.

Stationary-Source Noise Impacts. No mitigation measures are required.

On-Site Heating, Ventilating, and Air-Conditioning Units. All residential HVAC units shall be designed to meet the City's Municipal Code noise requirements.

3.6 Level of Significance after Mitigation

With implementation of the identified mitigation measures, potential short-term and long-term noise impacts would be reduced to below a level of significance.

4.0 REFERENCES

Bolt, Beranek & Newman. 1987. Noise Control for Buildings and Manufacturing Plants.

City of Lake Forest. CEQA Significance Thresholds for Noise.

———. Noise Element and Municipal Code Noise Ordinances.

Environmental Protection Agency. 1978. Protective Noise Levels, EPA 550/9-79-100. November.

Federal Highway Administration. 1977. Highway Traffic Noise Prediction Model, FHWA RD-77-108.

———. *Highway Construction Noise Handbook.* August 2006. Roadway Construction Noise Model, FHWA-HEP-06-015. DOT-VNTSC-FHWA-06-02. NTIS No. PB2006-109012.

Harris, Cyril M., ed. 1991. *Handbook of Acoustical Measurements and Noise Control*, Third Edition.

RBF Consulting. 2013. *Traffic Impact Study*. October.

APPENDIX A

FHWA HIGHWAY TRAFFIC NOISE PREDICTION MODEL OUTPUT

TABLE Existing-01
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Rancho Parkway west of Lake Forest Dr.
NOTES: Baker Ranch - Existing

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 8300 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 65.72

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	81.8	170.1	363.5

TABLE Existing-02
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Rancho Parkway between Lake Forest Dr. and Sports Park
NOTES: Baker Ranch - Existing

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 8900 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 66.03

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	85.3	178.1	380.8

TABLE Existing-03
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Rancho Parkway between Sports Park and Portola Pkwy.
NOTES: Baker Ranch - Existing

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 8100 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 65.62

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	80.6	167.4	357.7

TABLE Existing-04
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Lake Forest Dr. north of Rancho Pkwy
NOTES: Baker Ranch - Existing

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 16000 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 68.57

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
61.1	123.4	261.9	562.3

TABLE Existing-05
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Lake Forest Dr. south of Rancho Pkwy
NOTES: Baker Ranch - Existing

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 18500 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 69.20

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
66.4	135.5	288.3	619.3

TABLE Existing-06
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Portola Pkwy north of Rancho Pkwy
NOTES: Baker Ranch - Existing

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 23900 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 70.31

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
77.3	160.0	341.6	734.4

TABLE Existing-07
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Portola Pkwy south of Rancho Pkwy
NOTES: Baker Ranch - Existing

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 30600 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 71.39

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
89.9	188.1	402.5	865.8

TABLE Existing-08
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: SR-241 Tollroad
NOTES: Baker Ranch - Existing

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 39900 SPEED (MPH): 70 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.12	12.51	9.29
M-TRUCKS	2.10	0.12	0.26
H-TRUCKS	0.52	0.02	0.06

ACTIVE HALF-WIDTH (FT): 36 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 75.67

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
189.9	403.2	865.7	1863.5

TABLE Existing with Project-01

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Rancho Parkway west of Lake Forest Dr.
NOTES: Baker Ranch - Existing with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 8300 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 65.72

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	81.8	170.1	363.5

TABLE Existing with Project-02

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Rancho Parkway between Lake Forest Dr. and Sports Park
NOTES: Baker Ranch - Existing with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 9600 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 66.35

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	89.4	187.1	400.4

TABLE Existing with Project-03

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Rancho Parkway between Sports Park and Portola Pkwy.
NOTES: Baker Ranch - Existing with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 8700 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 65.93

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	84.2	175.4	375.1

TABLE Existing with Project-04

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Lake Forest Dr. north of Rancho Pkwy
NOTES: Baker Ranch - Existing with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 16300 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 68.65

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
61.8	124.9	265.1	569.2

TABLE Existing with Project-05

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Lake Forest Dr. south of Rancho Pkwy
NOTES: Baker Ranch - Existing with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 18900 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 69.30

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
67.2	137.4	292.4	628.2

TABLE Existing with Project-06

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Portola Pkwy north of Rancho Pkwy
NOTES: Baker Ranch - Existing with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 24200 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 70.37

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
77.9	161.3	344.5	740.6

TABLE Existing with Project-07

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Portola Pkwy south of Rancho Pkwy
NOTES: Baker Ranch - Existing with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 31000 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 71.44

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
90.6	189.7	406.0	873.4

TABLE Existing with Project-08

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: SR-241 Tollroad
NOTES: Baker Ranch - Existing with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 39900 SPEED (MPH): 70 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.12	12.51	9.29
M-TRUCKS	2.10	0.12	0.26
H-TRUCKS	0.52	0.02	0.06

ACTIVE HALF-WIDTH (FT): 36 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 75.67

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
189.9	403.2	865.7	1863.5

TABLE 2015 Cumulative w/o Project-01

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Rancho Parkway west of Lake Forest Dr.
NOTES: Baker Ranch - 2015 Cumulative w/o Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 12000 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 67.32

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	102.8	216.7	464.4

TABLE 2015 Cumulative w/o Project-02

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Rancho Parkway between Lake Forest Dr. and Sports Park
NOTES: Baker Ranch - 2015 Cumulative w/o Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 12000 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 67.32

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	102.8	216.7	464.4

TABLE 2015 Cumulative w/o Project-03

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Rancho Parkway between Sports Park and Portola Pkwy.
NOTES: Baker Ranch - 2015 Cumulative w/o Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 12000 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 67.32

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	102.8	216.7	464.4

TABLE 2015 Cumulative w/o Project-04

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Lake Forest Dr. north of Rancho Pkwy
NOTES: Baker Ranch - 2015 Cumulative w/o Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 22700 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 70.09

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
74.9	154.7	330.1	709.7

TABLE 2015 Cumulative w/o Project-05

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Lake Forest Dr. south of Rancho Pkwy
NOTES: Baker Ranch - 2015 Cumulative w/o Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 29900 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 71.29

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
88.6	185.2	396.4	852.6

TABLE 2015 Cumulative w/o Project-06

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Portola Pkwy north of Rancho Pkwy
NOTES: Baker Ranch - 2015 Cumulative w/o Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 31400 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 71.50

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
91.3	191.3	409.5	880.8

TABLE 2015 Cumulative w/o Project-07

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Portola Pkwy south of Rancho Pkwy
NOTES: Baker Ranch - 2015 Cumulative w/o Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 42600 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 72.82

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
110.6	233.8	501.5	1079.3

TABLE 2015 Cumulative w/o Project-08

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: SR-241 Tollroad
NOTES: Baker Ranch - 2015 Cumulative w/o Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 53800 SPEED (MPH): 70 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.12	12.51	9.29
M-TRUCKS	2.10	0.12	0.26
H-TRUCKS	0.52	0.02	0.06

ACTIVE HALF-WIDTH (FT): 36 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 76.97

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
230.4	491.4	1056.3	2274.2

TABLE 2015 Cumulative with Project-01
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Rancho Parkway west of Lake Forest Dr.
NOTES: Baker Ranch - 2015 Cumulative with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 12000 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 67.32

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	102.8	216.7	464.4

TABLE 2015 Cumulative with Project-02

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Rancho Parkway between Lake Forest Dr. and Sports Park
NOTES: Baker Ranch - 2015 Cumulative with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 12700 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 67.57

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	106.6	224.9	482.3

TABLE 2015 Cumulative with Project-03
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Rancho Parkway between Sports Park and Portola Pkwy.
NOTES: Baker Ranch - 2015 Cumulative with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 12600 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 67.53

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
0.0	106.0	223.7	479.7

TABLE 2015 Cumulative with Project-04
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Lake Forest Dr. north of Rancho Pkwy
NOTES: Baker Ranch - 2015 Cumulative with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 23000 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 70.15

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
75.5	156.1	333.0	715.9

TABLE 2015 Cumulative with Project-05

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Lake Forest Dr. south of Rancho Pkwy
NOTES: Baker Ranch - 2015 Cumulative with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 30300 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 71.35

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
89.3	186.9	399.9	860.2

TABLE 2015 Cumulative with Project-06

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Portola Pkwy north of Rancho Pkwy
NOTES: Baker Ranch - 2015 Cumulative with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 32300 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 71.62

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
92.9	194.9	417.2	897.6

TABLE 2015 Cumulative with Project-07

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Portola Pkwy south of Rancho Pkwy
NOTES: Baker Ranch - 2015 Cumulative with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 43300 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 72.90

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
111.8	236.3	507.0	1091.1

TABLE 2015 Cumulative with Project-08

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: SR-241 Tollroad
NOTES: Baker Ranch - 2015 Cumulative with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 53800 SPEED (MPH): 70 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.12	12.51	9.29
M-TRUCKS	2.10	0.12	0.26
H-TRUCKS	0.52	0.02	0.06

ACTIVE HALF-WIDTH (FT): 36 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 76.97

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
230.4	491.4	1056.3	2274.2

TABLE 2030 Cumulative without Project-01

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Rancho Parkway west of Lake Forest Dr.
NOTES: Baker Ranch - 2030 Cumulative without Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 20000 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 69.54

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
69.5	142.5	303.6	652.3

TABLE 2030 Cumulative without Project-02

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Rancho Parkway between Lake Forest Dr. and Sports Park
NOTES: Baker Ranch - 2030 Cumulative without Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 27000 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 70.84

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
83.2	173.3	370.4	796.6

TABLE 2030 Cumulative without Project-03

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Rancho Parkway between Sports Park and Portola Pkwy.
NOTES: Baker Ranch - 2030 Cumulative without Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 27000 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 70.84

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
83.2	173.3	370.4	796.6

TABLE 2030 Cumulative without Project-04

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Lake Forest Dr. north of Rancho Pkwy
NOTES: Baker Ranch - 2030 Cumulative without Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 27600 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 70.94

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
84.3	175.8	375.9	808.3

TABLE 2030 Cumulative without Project-05

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Lake Forest Dr. south of Rancho Pkwy
NOTES: Baker Ranch - 2030 Cumulative without Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 36800 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 72.19

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
100.8	212.3	455.0	979.1

TABLE 2030 Cumulative without Project-06

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Portola Pkwy north of Rancho Pkwy
NOTES: Baker Ranch - 2030 Cumulative without Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 33900 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 71.83

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
95.8	201.2	430.9	927.0

TABLE 2030 Cumulative without Project-07

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Portola Pkwy south of Rancho Pkwy
NOTES: Baker Ranch - 2030 Cumulative without Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 51500 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 73.65

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
124.9	265.0	569.0	1224.8

TABLE 2030 Cumulative without Project-08

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: SR-241 Tollroad
NOTES: Baker Ranch - 2030 Cumulative without Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 121100 SPEED (MPH): 70 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.12	12.51	9.29
M-TRUCKS	2.10	0.12	0.26
H-TRUCKS	0.52	0.02	0.06

ACTIVE HALF-WIDTH (FT): 36 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 80.49

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
392.4	842.5	1813.5	3905.7

TABLE 2030 Cumulative with Project-01
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Rancho Parkway west of Lake Forest Dr.
NOTES: Baker Ranch - 2030 Cumulative with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 19400 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 69.41

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
68.3	139.7	297.5	639.2

TABLE 2030 Cumulative with Project-02

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Rancho Parkway between Lake Forest Dr. and Sports Park
NOTES: Baker Ranch - 2030 Cumulative with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 20300 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 69.61

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
70.1	143.9	306.6	658.8

TABLE 2030 Cumulative with Project-03

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Rancho Parkway between Sports Park and Portola Pkwy.
NOTES: Baker Ranch - 2030 Cumulative with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 21500 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 69.86

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
72.5	149.4	318.5	684.5

TABLE 2030 Cumulative with Project-04

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Lake Forest Dr. north of Rancho Pkwy
NOTES: Baker Ranch - 2030 Cumulative with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 25600 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 70.61

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
80.5	167.4	357.6	768.8

TABLE 2030 Cumulative with Project-05

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Lake Forest Dr. south of Rancho Pkwy
NOTES: Baker Ranch - 2030 Cumulative with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 33800 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 71.82

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
95.6	200.8	430.0	925.1

TABLE 2030 Cumulative with Project-06

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Portola Pkwy north of Rancho Pkwy
NOTES: Baker Ranch - 2030 Cumulative with Project

---

* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 32900 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 71.70

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
94.0	197.2	422.4	908.7

TABLE 2030 Cumulative with Project-07

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: Portola Pkwy south of Rancho Pkwy
NOTES: Baker Ranch - 2030 Cumulative with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 48600 SPEED (MPH): 50 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 24 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 73.40

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
120.3	255.1	547.5	1178.4

TABLE 2030 Cumulative with Project-08

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 10/23/2013
ROADWAY SEGMENT: SR-241 Tollroad
NOTES: Baker Ranch - 2030 Cumulative with Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 121100 SPEED (MPH): 70 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.12	12.51	9.29
M-TRUCKS	2.10	0.12	0.26
H-TRUCKS	0.52	0.02	0.06

ACTIVE HALF-WIDTH (FT): 36 SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 80.49

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
392.4	842.5	1813.5	3905.7

Appendix I

Traffic Impact Analysis

BAKER RANCH
30 ACRE RESIDENTIAL
TRAFFIC IMPACT ANALYSIS

City of Lake Forest

Prepared for

BAKER RANCH PROPERTIES

Prepared by

RBF CONSULTING
A Baker Company

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February 5, 2014

JN 136750

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EXECUTIVE SUMMARY

This study analyzes forecast traffic conditions associated with the proposed Baker Ranch 30 acre residential project in the City of Lake Forest planned to open in 2015. The proposed project consists of 250 single-family dwelling units at the project site located between the SR-241 Tollroad and Rancho Parkway at Portola Parkway. Site access for the project site is provided at the Sports Park at Rancho Parkway intersection.

The existing project site is currently occupied by a variety of yard uses that will be displaced by the proposed project. The Baker Ranch Planned Community Text contemplates that the site could be developed with 341,499 square feet of commercial uses, so if the proposed project is not approved by the City, the currently allowed commercial use should be assumed as the project site will not remain vacant or with current yard uses indefinitely.

For existing plus project conditions, the net trip generation of the proposed project in addition to the number of trips presently generated by the existing yard uses, is approximately 1,350 trips, which includes approximately 138 a.m. peak hour trips and approximately 148 p.m. peak hour trips.

For year 2015 with project conditions, the net trip generation of the proposed project in addition to the number of trips presently generated by existing yard uses is approximately 1,350 trips, which includes approximately 138 a.m. peak hour trips and approximately 148 p.m. peak hour trips (same as existing plus project conditions).

The proposed residential use of the project site, rather than the currently allowed commercial land use of 341,449 square feet, would result in the project site generating 83% fewer average daily trips than is presently contemplated at buildout of a commercial project. So for year 2030 with project conditions, the net trip generation of the proposed project, when compared to buildout of the currently allocated commercial land use, is approximately 12,200 fewer trips, which includes approximately 140 fewer a.m. peak hour trips and approximately 1,016 fewer p.m. peak hour trips.

Based on City of Lake Forest thresholds of significance, the addition of project-generated trips is forecast to result in no significant impacts at the study intersections for the evaluated analysis scenarios.

No traffic mitigation measures are required for the proposed project since no significant traffic impacts are forecast to occur as a result of the proposed project. Table 10 summarizes the intersection LOS results for the evaluated analysis scenarios.

INTRODUCTION

This study analyzes forecast traffic conditions associated with the proposed Baker Ranch 30 acre residential project in the City of Lake Forest planned to open in 2015. The proposed project consists of 250 single-family dwelling units at the project site located between the SR-241 Tollroad and Rancho Parkway at Portola Parkway. Site access for the project site is provided at the Sports Park at Rancho Parkway intersection.

The existing project site is currently occupied by a variety of yard uses that will be displaced by the proposed project.

Exhibit 1 shows the regional location of the project site. Exhibit 2 shows the project site location.

Study Area

This study analyzes the following four (4) intersections in the vicinity of the project site identified by City staff:

1. Lake Forest Drive/Rancho Parkway (signalized);
2. Portola Parkway/Rancho Parkway (signalized);
3. Portola Parkway/El Toro Road (signalized); and
4. Sports Park/Rancho Parkway (unsignalized).

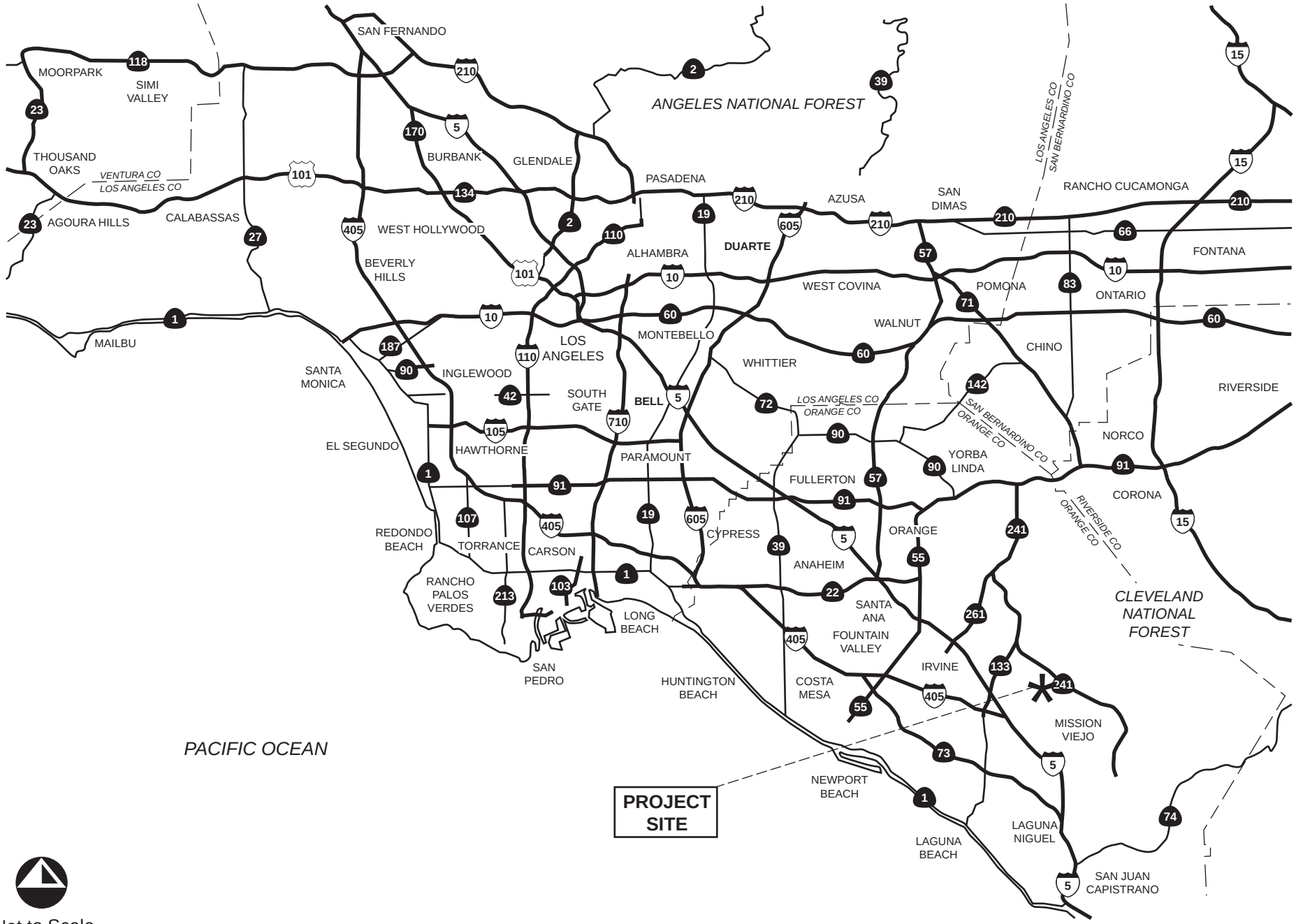
Exhibit 3 shows the location of the study intersections, which are analyzed for the following six study scenarios:

- Existing Conditions;
- Forecast Existing Plus Project Conditions;
- Forecast Year 2015 Without Project Conditions;
- Forecast Year 2015 With Project Conditions;
- Forecast Year 2030 Without Project Conditions; and
- Forecast Year 2030 With Project Conditions.

INTERSECTION ANALYSIS METHODOLOGY

Traffic Model Background

The traffic forecast data utilized in this analysis was provided by *Stantec Consulting Services Inc.* using the Lake Forest Traffic Analysis Model (LFTAM), which assumes 341,449 square feet of commercial land use currently allocated to the project site. Traffic forecast data with the currently allocated commercial land use was provided by the City for No-Project conditions and trips generated by the proposed project were manually added to the forecast traffic volumes to determine With-Project conditions. The LFTAM traffic forecasting model is a focused sub-area model derived from the Orange County Transportation Analysis Model (OCTAM) and was specially designed to provide detailed forecasting capability within the City of Lake Forest,



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Regional Project Location

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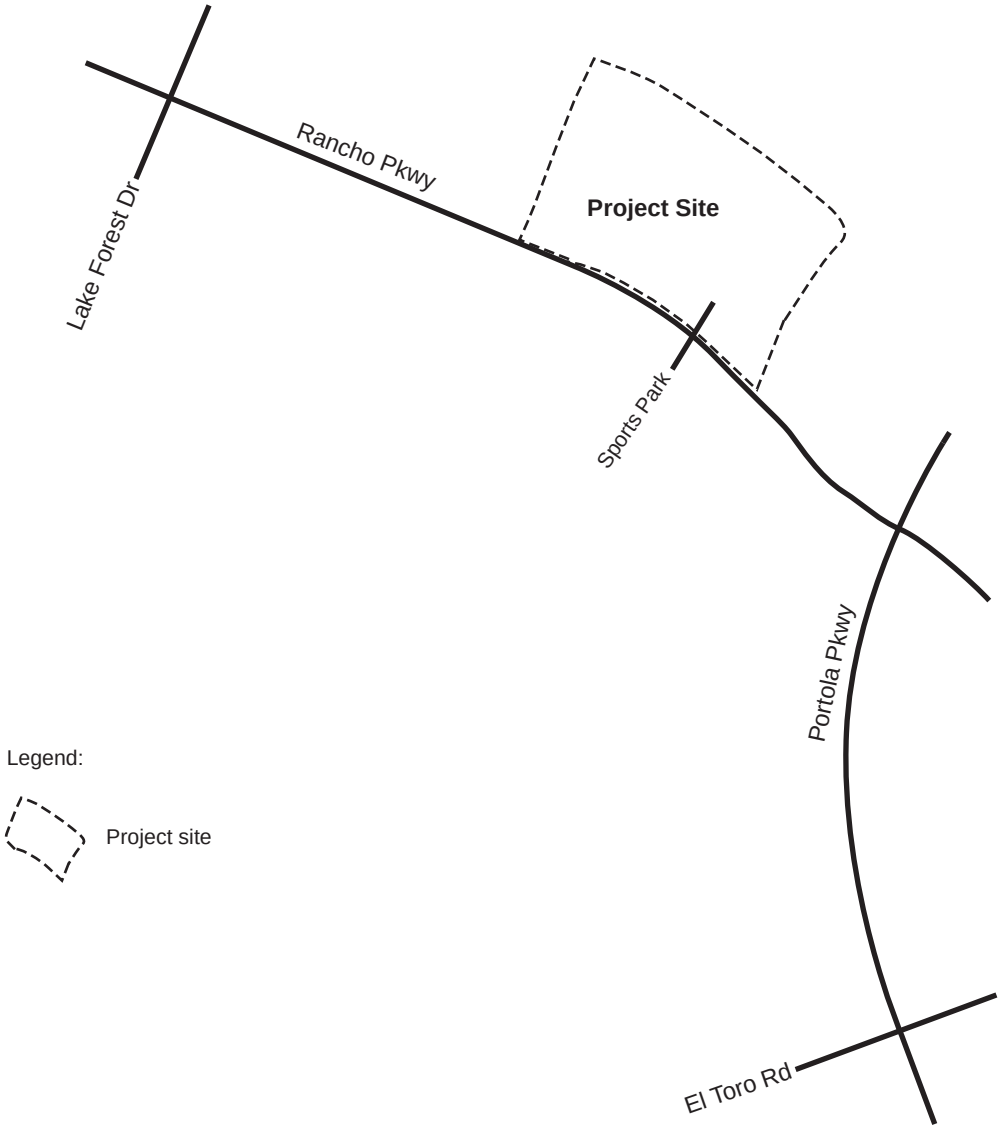
Exhibit 1



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Proposed Project Site Location

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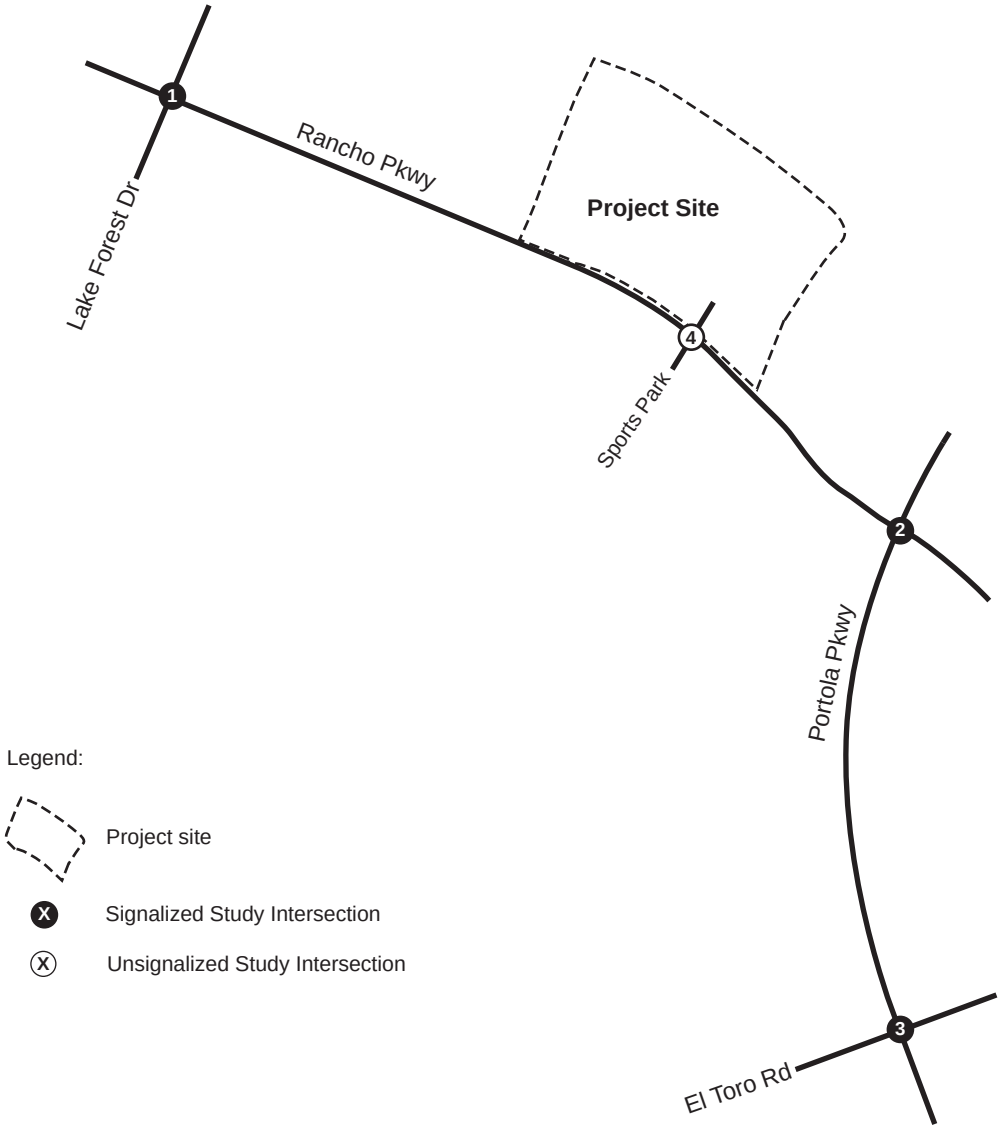
Exhibit 2



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Study Intersection Locations

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SEP/2013

Exhibit 3

including the study area. The OCTAM is maintained by the Orange County Transportation Authority (OCTA), and has been developed according to the Orange County sub-area traffic modeling guidelines adopted by the OCTA. The OCTA has certified the LFTAM traffic model as being consistent with the OCTAM regional model.

At locations where forecast data was not available, the traffic volumes were derived based on discussions with and the approval of City of Lake Forest staff. Appendix A includes the LFTAM traffic forecast data provided by the City of Lake Forest.

The City uses the LFTAM data as part of its protocol to determine whether operational characteristics of intersection throughout the City require detailed analysis due to trips expected to be generated by each project proposed for development. Accordingly, the City used LFTAM data plus trip generation expected from the project site to review the potential of the proposed project to affect the operation of an intersection anywhere in the City in an unacceptable manner. In the case of the project site, two intersections were identified by the City protocol for further analysis due to the addition of project trips (Portola Parkway at Rancho Parkway and Lake Forest at Rancho Parkway). In addition, to be conservative, Portola Parkway at El Toro Road and Rancho Parkway at the future Sports Park entrance were also subjected to more rigorous analysis at the request of the City. This Traffic Impact Analysis reports the results of such detailed analysis.

Level of Service Methodology

Level of service (LOS) is commonly used as a qualitative description of intersection operation and is based on the capacity of the intersection and the volume of traffic using the intersection. The *Intersection Capacity Utilization (ICU)* analysis method is utilized by the City of Lake Forest to determine the operating LOS of signalized intersections. The *ICU* analysis methodology describes the operation of an intersection using a range of LOS from LOS A (free-flow conditions) to LOS F (severely congested conditions), based on the corresponding volume to capacity (V/C) ratios shown in Table 1.

Table 1
Study Intersection V/C Ratio & LOS Ranges

V/C Ratio	LOS
≤ 0.60	A
0.61 to ≤ 0.70	B
0.71 to ≤ 0.80	C
0.81 to ≤ 0.90	D
0.91 to ≤ 1.00	E
> 1.00	F

Note: V/C Ratio = Volume to Capacity Ratio.
Source: *1990 Transportation Research Board.*

The *2000 HCM* analysis methodology describes the operation of an intersection using a range of LOS from LOS A (free-flow conditions) to LOS F (severely congested conditions). The *HCM* analysis in this report is provided for informational purposes only and is based on the corresponding ranges of stopped delay experienced per vehicle for signalized and unsignalized intersections shown in Table 2.

Table 2
LOS & Delay Ranges

LOS	Delay (seconds/vehicle)	
	Signalized Intersections	**Unsignalized Intersections**
A	≤ 10.0	≤ 10.0
B	> 10.0 to ≤ 20.0	> 10.0 to ≤ 15.0
C	> 20.0 to ≤ 35.0	> 15.0 to ≤ 25.0
D	> 35.0 to ≤ 55.0	> 25.0 to ≤ 35.0
E	> 55.0 to ≤ 80.0	> 35.0 to ≤ 50.0
F	> 80.0	> 50.0

Source: *2000 Highway Capacity Manual*

Level of service is based on the average stopped delay per vehicle for all movements of signalized intersections and all-way stop-controlled intersections; for one-way or two-way stop-controlled intersections, LOS is based on the worst stop-controlled approach.

Performance Criteria

As stated in the City of Lake Forest General Plan Circulation Element, the City goal for peak hour intersection operation is LOS D or better.

City of Lake Forest Thresholds of Significance

The City of Lake Forest requires the *ICU* analysis methodology be utilized to determine potential significant traffic impacts of proposed projects; the *HCM* analysis is provided for informational purposes only at State Highway intersections and unsignalized intersections.

To determine whether the addition of project-generated trips results in a significant impact at a study intersection, and thus requires mitigation, the City of Lake Forest utilizes the following thresholds of significance:

- A significant project impact occurs at a study intersection when the addition of project-generated trips causes the peak hour level of service of the study intersection to change from acceptable operation (LOS A, B, C, or D) to deficient operation (LOS E or F); or
- A significant project impact occurs at a study intersection when the addition of project-generated trips causes an ICU increase of 0.02 or more at an intersection operating deficiently (LOS E or F).

Existing Conditions Traffic Volumes

To determine existing operation of the study intersections, a.m. peak period and p.m. peak period traffic movement counts were collected in July 2013 during typical weekday conditions, except for the traffic movement counts at the Lake Forest Drive/Rancho Parkway intersection, which were collected in May 2013 and provided by the City of Lake Forest for use in this analysis. The a.m. peak period intersection counts were collected from 7:00 a.m. to 9:00 a.m.; the p.m. peak period intersection counts were collected from 4:00 p.m. to 6:00 p.m. The traffic

volumes used in this analysis were taken from the highest hour within the two-hour peak period counted. Detailed traffic count data sheets are contained in Appendix B.

Exhibit 4 shows existing conditions average daily traffic (ADT) volumes on the roadways in the vicinity of the project site. Existing ADT volumes have been estimated based on the average of the existing two-way a.m. peak hour and p.m. peak hour volumes times a factor of 10. Exhibit 5 shows a.m. and p.m. peak hour volumes at the study intersections. Exhibit 6 shows existing study intersection geometry and control.

Existing Conditions Intersection Peak Hour Level of Service

Table 3 summarizes existing conditions a.m. peak hour and p.m. peak hour LOS of the City study intersections; detailed LOS analysis sheets are contained in Appendix C.

Table 3
Existing Conditions AM & PM Peak Hour Intersection LOS

Study Intersection	V/C (Delay) – LOS	
	AM Peak Hour	PM Peak Hour
1. Lake Forest Dr / Rancho Pkwy	0.40 – A	0.56 – A
2. Portola Pkwy / Rancho Pkwy	0.39 – A	0.41 – A
3. Portola Pkwy / El Toro Rd	0.51 – A	0.64 – B
4. Sports Park / Rancho Pkwy	(13.3) – B	(18.7) – C

Notes: V/C = volume to capacity ratio; delay (in seconds) shown for informational purposes at unsignalized intersections only.

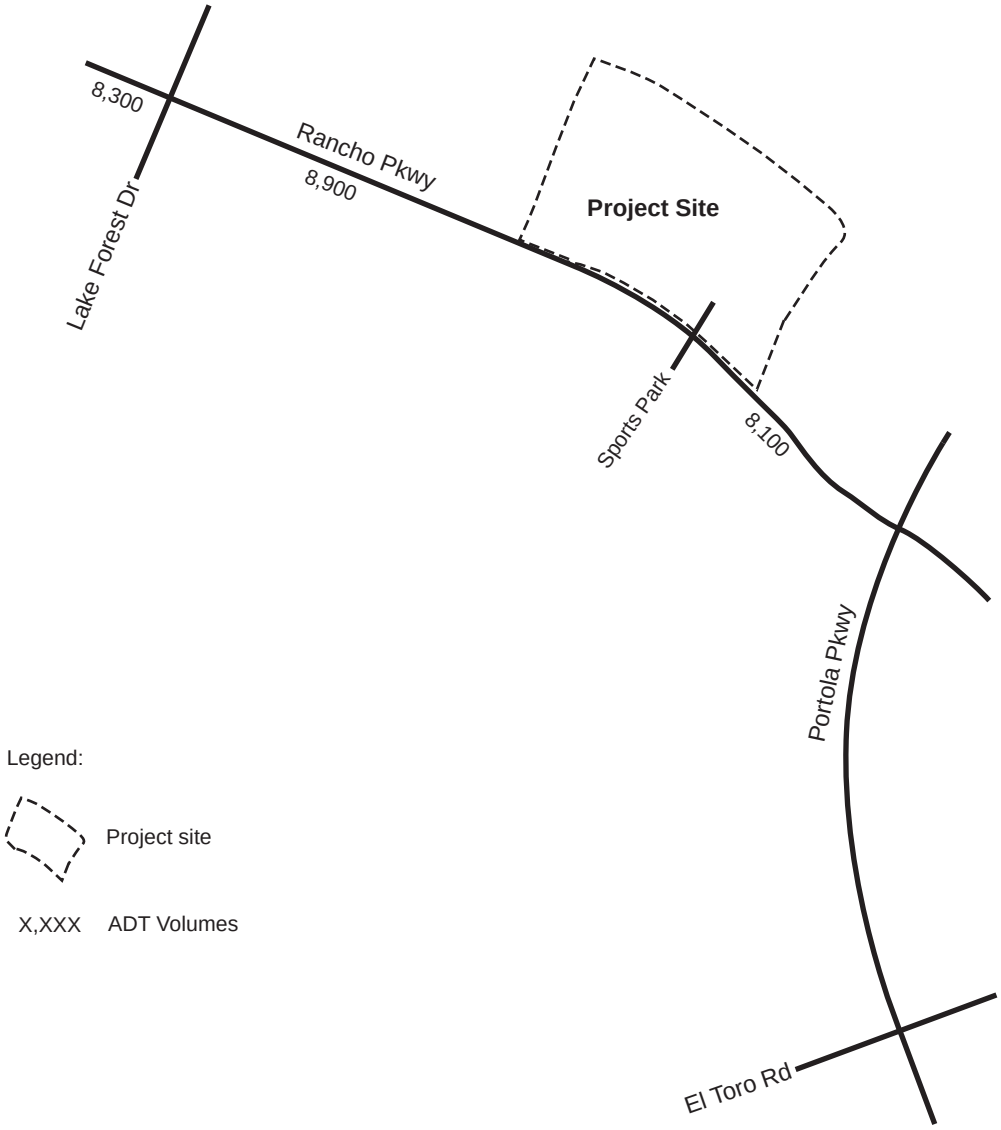
As shown in Table 3, the study intersections are currently operating at an acceptable LOS (LOS D or better) according to City of Lake Forest performance criteria.

PROPOSED PROJECT

This study analyzes forecast traffic conditions associated with the proposed Baker Ranch 30 acre residential project in the City of Lake Forest planned to open in 2015. The proposed project consists of 250 single-family dwelling units at the project site located between the SR-241 Tollroad and Rancho Parkway at Portola Parkway. Site access for the project site is provided at the Sports Park at Rancho Parkway intersection.

The existing project site is currently occupied by a variety of yard uses that will be displaced by the proposed project.

Exhibit 7 shows the proposed project site plan; this analysis conservatively assumes 250 single-family dwelling units, which is the maximum number of units that could be built onsite pursuant to project entitlement.



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Existing Conditions Roadway Segment ADT Volumes

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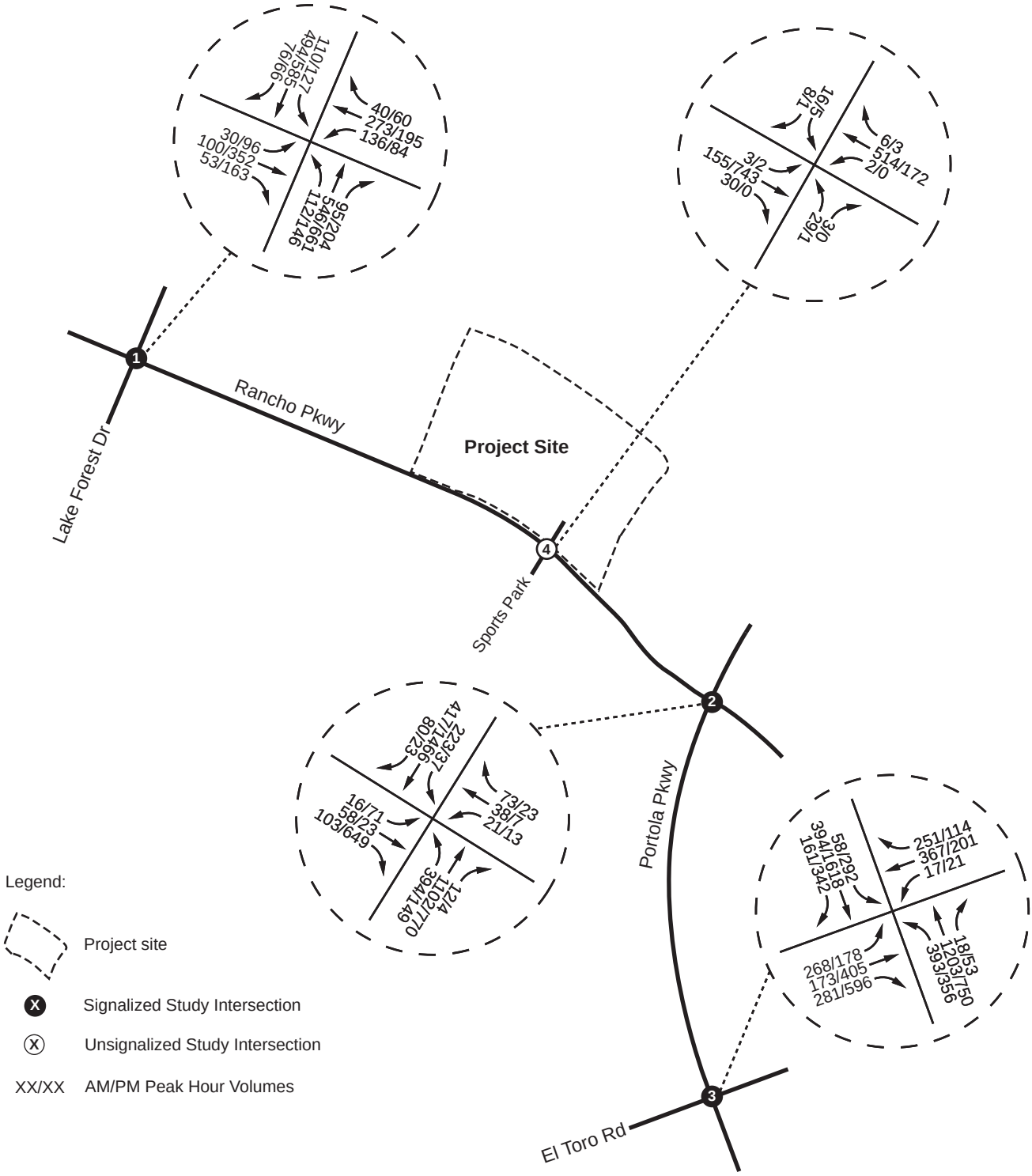
Exhibit 4



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Existing Conditions AM/PM Peak Hour Intersection Volumes

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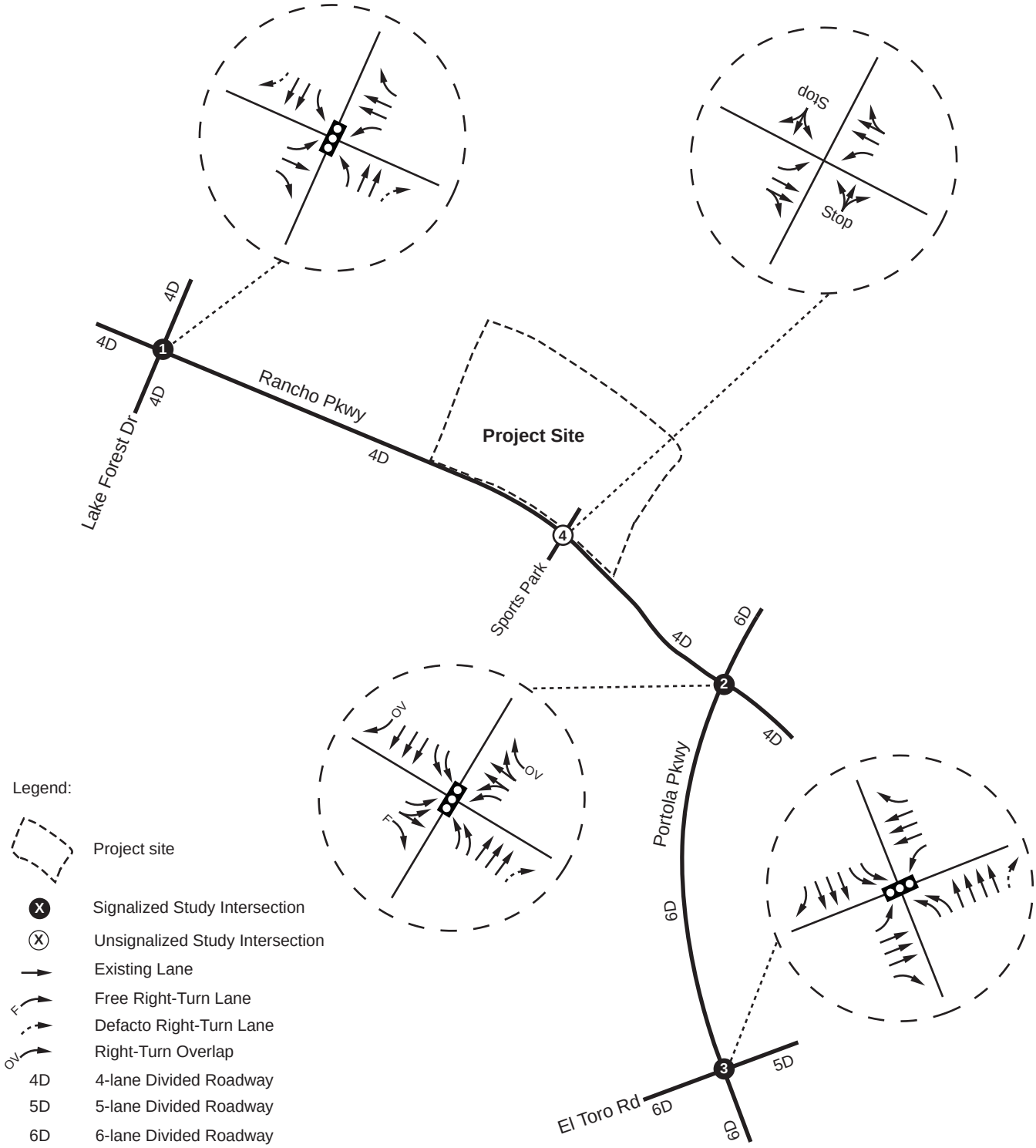
Exhibit 5



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Existing Conditions Intersection Geometry and Control

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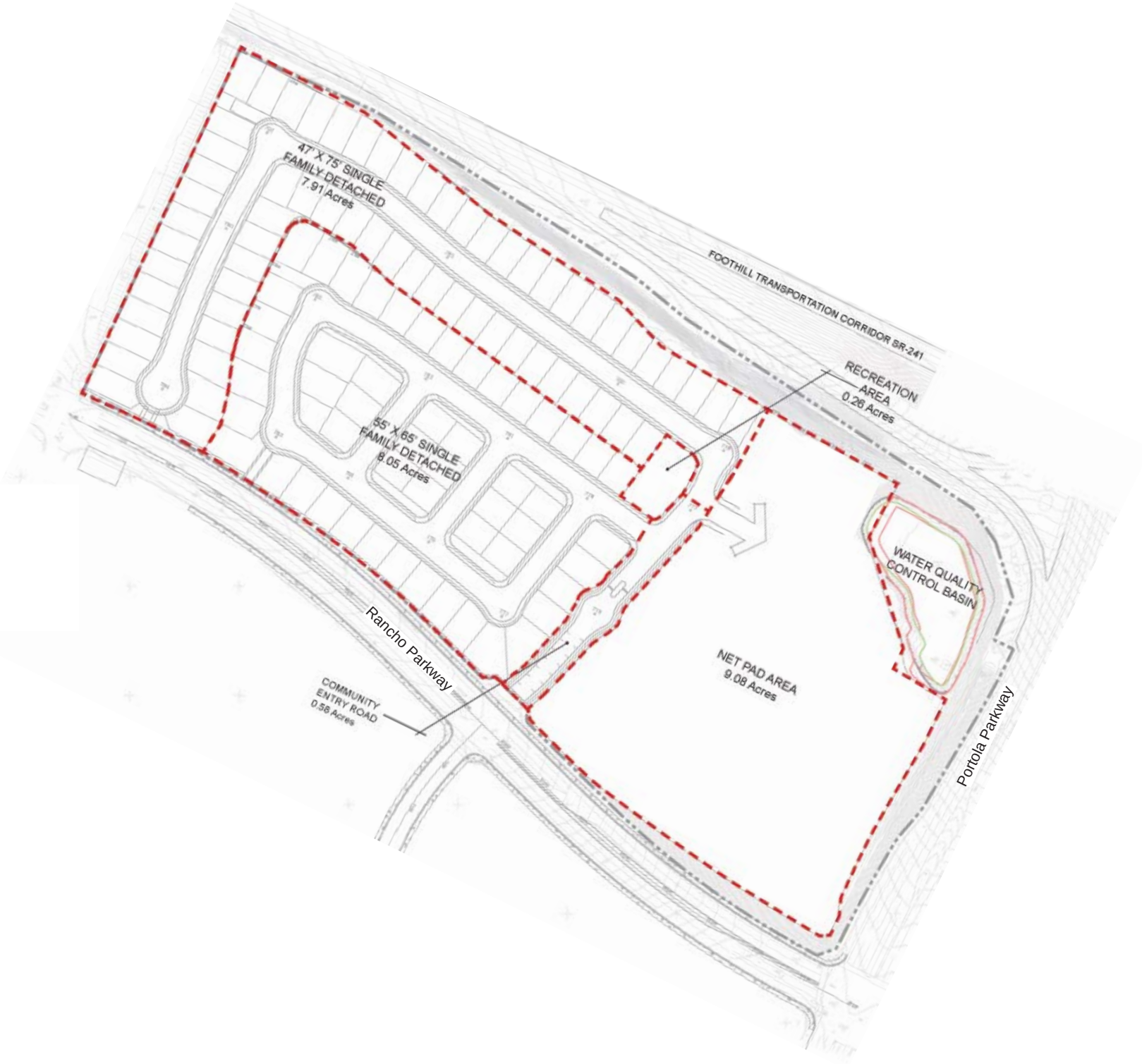
Exhibit 6



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Source: Baker Ranch Properties

Proposed Project Site Plan

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SEP/2013

Exhibit 7

Forecast Project Trip Generation

To determine the number of trips currently generated by the existing land uses that will be displaced by the proposed project, traffic counts were collected at the project site in July 2013 during typical weekday conditions. To calculate trips forecast to be generated by the currently allocated land use and the proposed project, *Institute of Transportation Engineers (ITE)* trip generation rates were utilized.

Table 4 summarizes the number of trips generated by the project site for each analysis scenario. As shown in Table 4, the proposed project (250 single-family detached residential dwelling units) is forecast to generate approximately 2,380 trips, which includes approximately 188 a.m. peak hour trips and approximately 251 p.m. peak hour trips.

For existing plus project conditions, the net trip generation of the proposed project in addition to the number of trips presently generated by the existing yard uses, is approximately 1,350 trips, which includes approximately 138 a.m. peak hour trips and approximately 148 p.m. peak hour trips.

For year 2015 without project conditions, it is assumed that the currently allocated commercial land use will not yet be developed and the project site will continue to generate trips from the existing yard uses.

For year 2015 with project conditions, the net trip generation of the proposed project in addition to the number of trips presently generated by the existing yard uses, is approximately 1,350 trips, which includes approximately 138 a.m. peak hour trips and approximately 148 p.m. peak hour trips (same as existing plus project conditions).

For year 2030 without project conditions, it is assumed that the project site will generate trips from buildout of the currently allocated commercial land use.

For year 2030 with project conditions, the net trip generation of the proposed project replacing the currently allocated commercial land use, is approximately 12,200 fewer trips, which includes approximately 140 fewer a.m. peak hour trips and approximately 1,016 fewer p.m. peak hour trips.

Table 4
Project Trip Generation Summary

Land Use	Quantity	Units	AM Peak Hour			PM Peak Hour			Daily Trips
			In	Out	Total	In	Out	Total	
Existing									
Yard Uses[1]	-	-	18	32	50	36	67	103	1,030
Existing Plus Project									
Yard Uses	-	-	-18	-32	-50	-36	-67	-103	-1,030
Single-Family Detached Residential[2]	250	du	48	140	188	158	93	251	2,380
Net Trip Generation			**30**	**108**	**138**	**122**	**26**	**148**	**1,350**
Year 2015 Without Project									
Yard Uses	-	-	18	32	50	36	67	103	1030
Year 2015 With Project									
Yard Uses	-	-	-18	-32	-50	-36	-67	-103	-1,030
Single-Family Detached Residential	250	du	48	140	188	158	93	251	2,380
Net Trip Generation			**30**	**108**	**138**	**122**	**26**	**148**	**1,350**
Year 2030 Without Project									
Shopping Center[2]	341.449	tsf	205	123	328	608	659	1,267	14,580
Year 2030 With Project									
Shopping Center	341.449	tsf	-205	-123	-328	-608	-659	-1,267	-14,580
Single-Family Detached Residential	250	du	48	140	188	158	93	251	2,380
Net Trip Generation			**-157**	**17**	**-140**	**-450**	**-566**	**-1,016**	**-12,200**
Trip Rates									
Single-Family Detached Residential	250	du	0.19	0.56	0.75	0.63	0.37	1.00	9.52
Shopping Center	341.449	tsf	0.60	0.36	0.96	1.78	1.93	3.71	42.70

Source: 1) Based on existing traffic count observations conducted on July 30, 2013. Daily trips have been estimated as ten times the PM Peak Hour trips.
2) *2012 ITE Trip Generation Manual*, 9th Edition, Single-Family Detached Residential (210) Land Use and Shopping Center (820) Land Use.

Notes: du = dwelling units; tsf = thousand square feet.

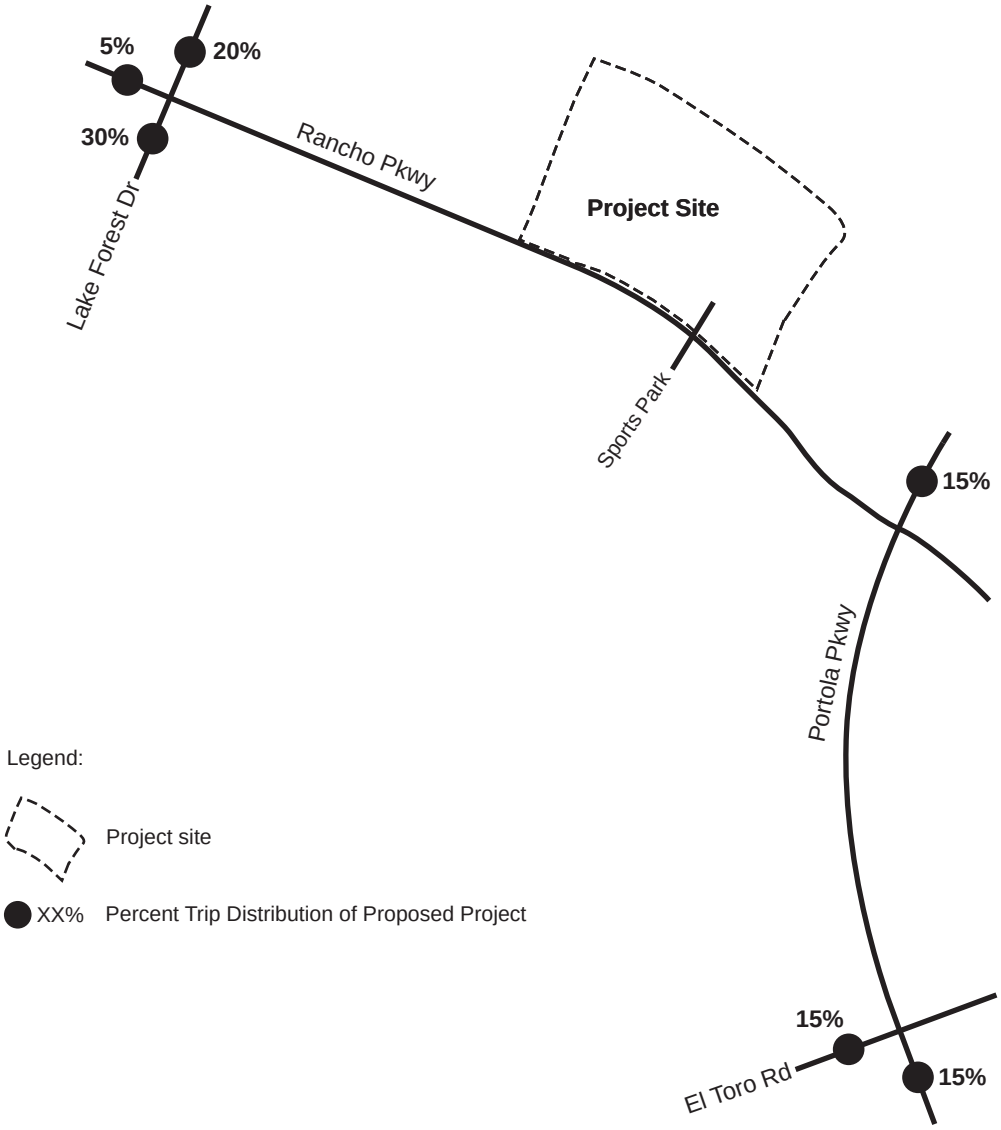
Forecast Project Trip Distribution

Exhibit 8 shows the forecast trip percent distribution of project-generated trips.

Forecast Project Trip Assignment

Exhibit 9 shows the corresponding roadway segment ADT trip assignment of the proposed project assuming the trip percent distributions shown in Exhibit 8.

Based on the trip generation for existing plus project and year 2015 with project conditions, Exhibit 10 shows the corresponding ADT and a.m./p.m. peak hour assignment of project-generated net trips assuming the trip percent distributions shown in Exhibit 8. Based on the trip generation for year 2030 with project conditions, Exhibit 11 shows the corresponding ADT and a.m./p.m. peak hour assignment of project-generated net trips assuming the trip percent distributions shown in Exhibit 8.



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Forecast Trip Percent Distribution of Proposed Project

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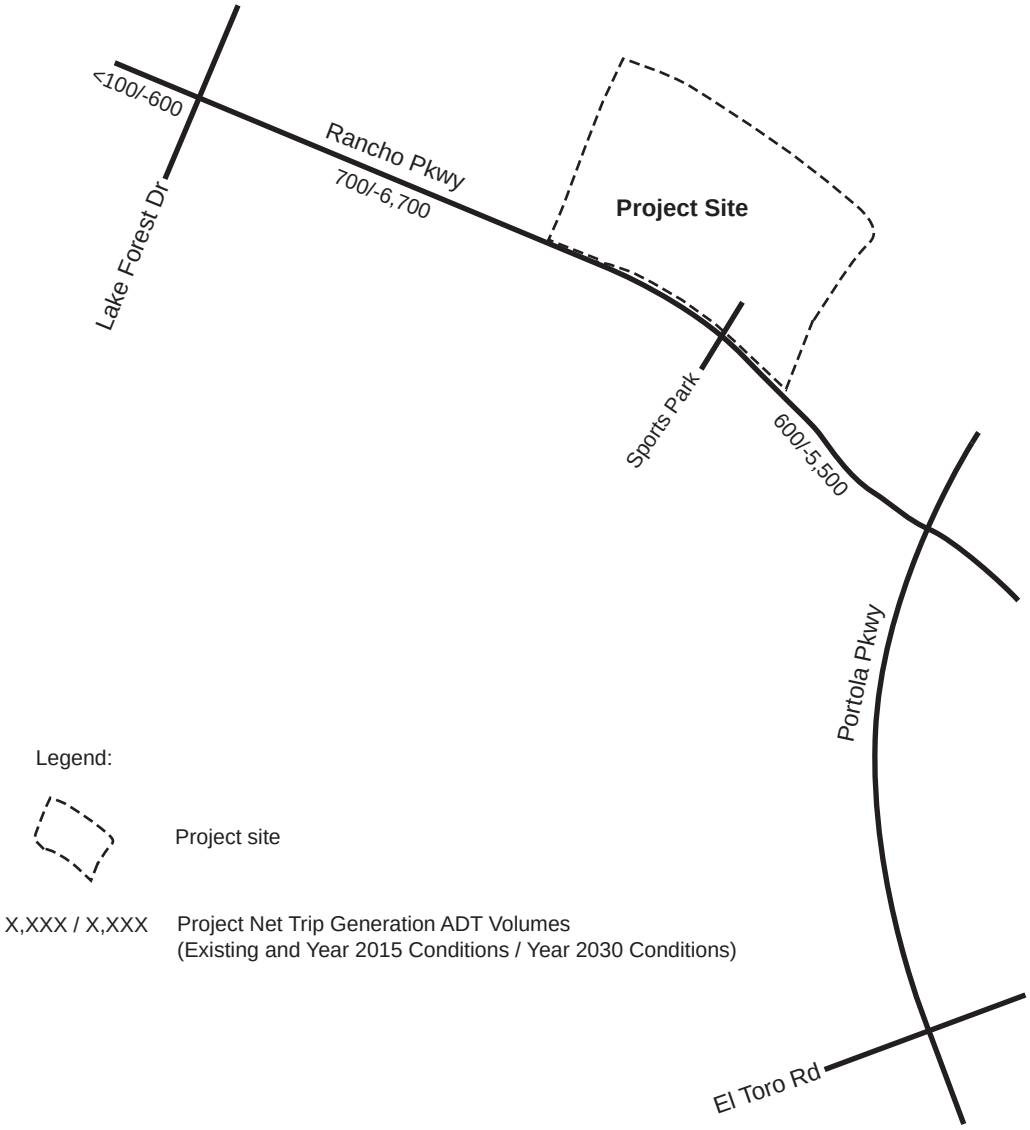
Exhibit 8



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Forecast Roadway Segment
ADT Trip Assigment of Proposed Project

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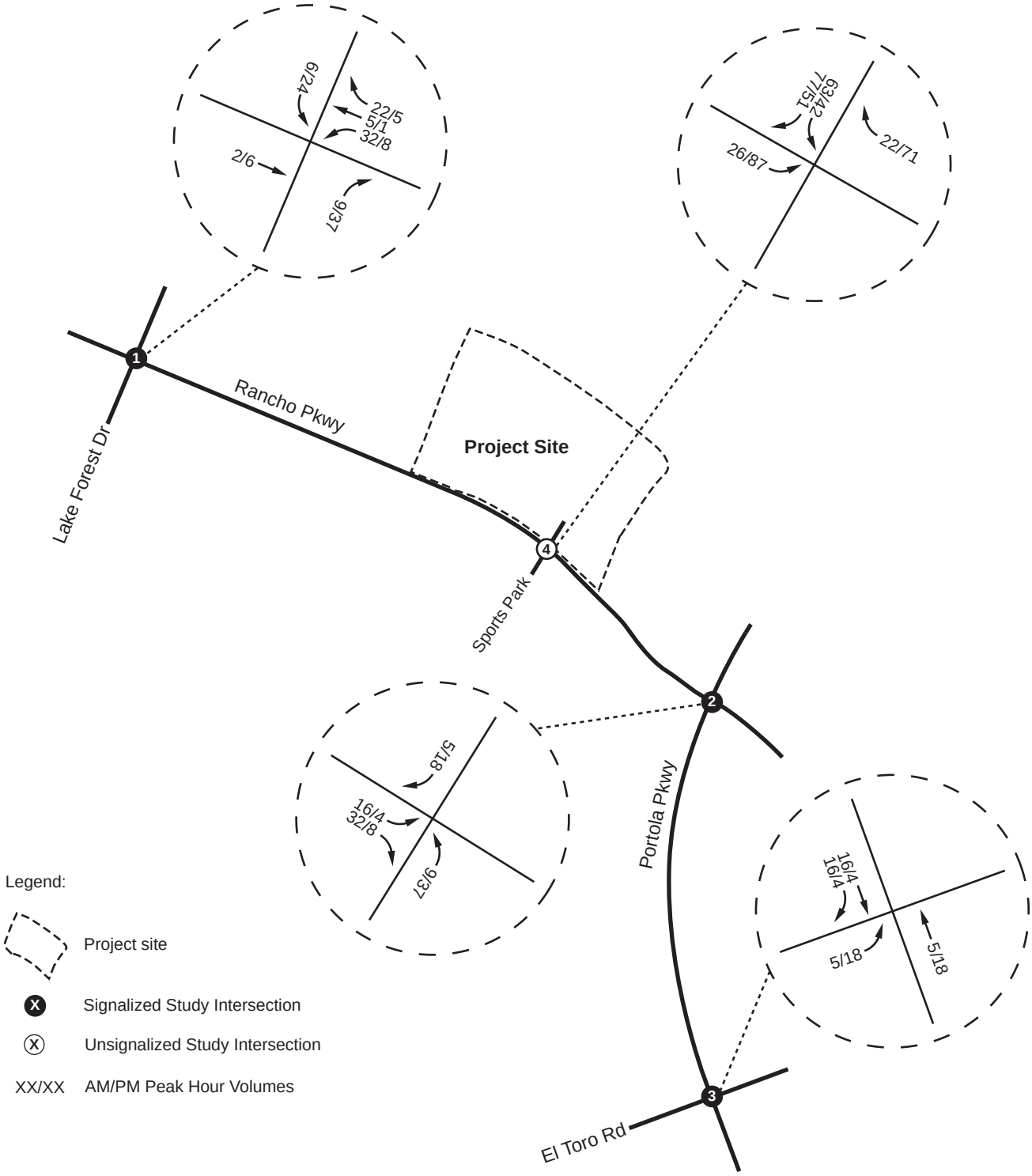
Exhibit 9



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Forecast AM & PM Peak Hour Trip Assignment of Proposed Project (Existing and Year 2015 Net Trip Generation)

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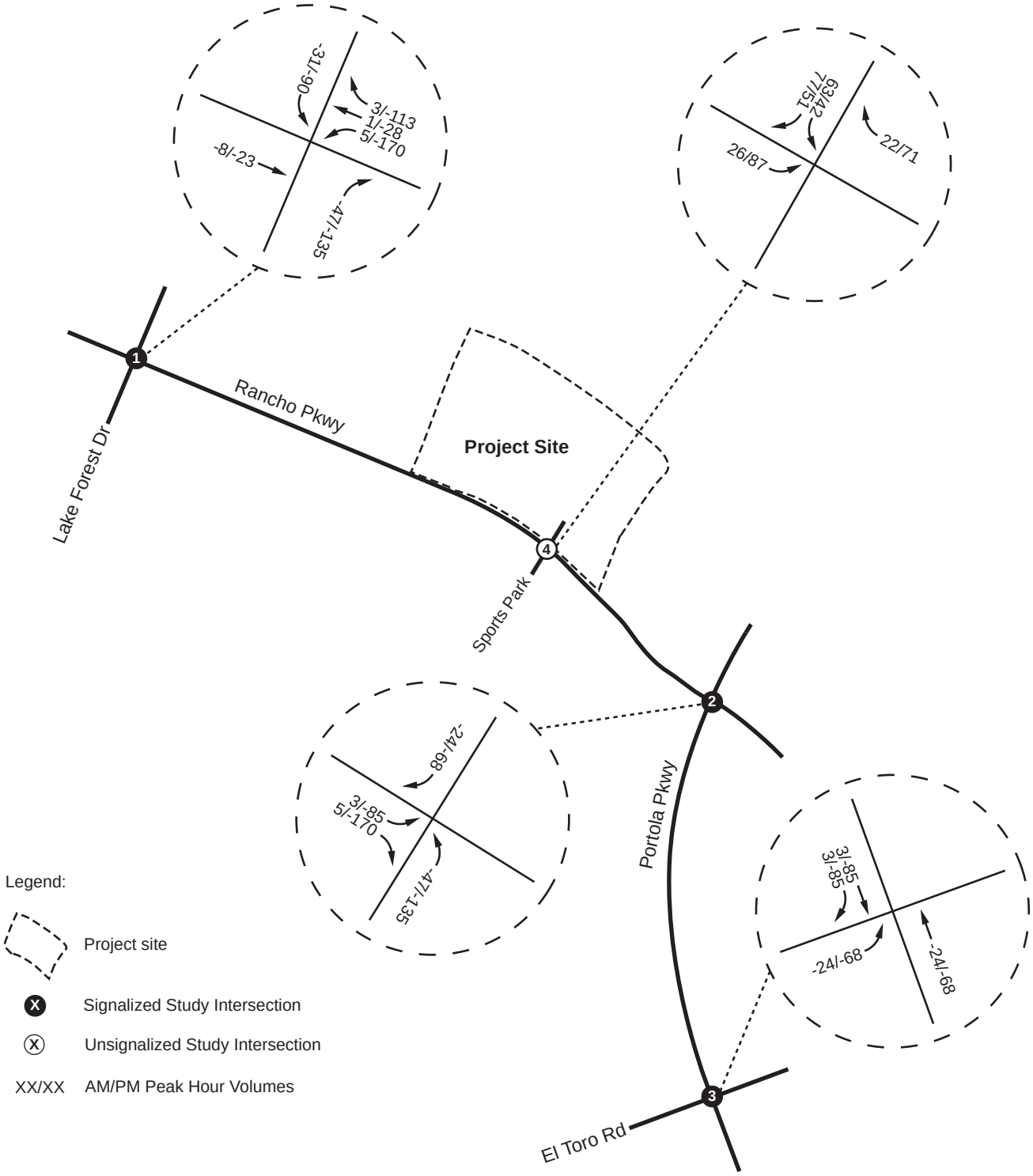
SEP/2013

Exhibit 10



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RBF A Baker Company

Forecast AM & PM Peak Hour Trip Assignment of Proposed Project (Year 2030 Net Trip Generation)

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Exhibit 11

FORECAST EXISTING PLUS PROJECT CONDITIONS

Forecast existing plus project conditions a.m. and p.m. peak hour volumes were derived by adding forecast project-generated trips to existing conditions traffic volumes. It should be noted, no adjustment was made to existing traffic count data to account for any current and temporary uses near the project site; therefore, this analysis may slightly overestimate traffic conditions under the existing plus project analysis scenario. Specifically, the future sports park located on the south side of Rancho Parkway opposite the proposed project is currently under construction and generating temporary construction trips.

Forecast Existing Plus Project Traffic Volumes

Exhibits 12 and 13 show forecast existing plus project conditions ADT and a.m. and p.m. peak hour volumes at the study intersections.

Forecast Existing Plus Project Conditions Intersection Peak Hour Level of Service

Table 5 summarizes forecast existing plus project conditions a.m. peak hour and p.m. peak hour LOS of the study intersections; detailed LOS analysis sheets are contained in Appendix C.

Table 5
Forecast Existing Plus Project Conditions AM & PM Peak Hour Intersection LOS

Study Intersection	Existing Conditions		Forecast Existing Plus Project Conditions		Change in V/C (Delay)		Significant Impact?
	V/C (Delay) – LOS		V/C (Delay) – LOS		AM Peak Hour	PM Peak Hour	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour			
1. Lake Forest Dr / Rancho Pkwy	0.40 – A	0.56 – A	0.44 – A	0.60 – A	0.04	0.04	No
2. Portola Pkwy / Rancho Pkwy	0.39 – A	0.41 – A	0.39 – A	0.43 – A	0.00	0.02	No
3. Portola Pkwy / El Toro Rd	0.51 – A	0.64 – B	0.52 – A	0.65 – B	0.01	0.01	No
4. Sports Park / Rancho Pkwy	(13.3) – B	(18.7) – C	(15.3) – C	(25.3) – D	(2.0)	(6.6)	No

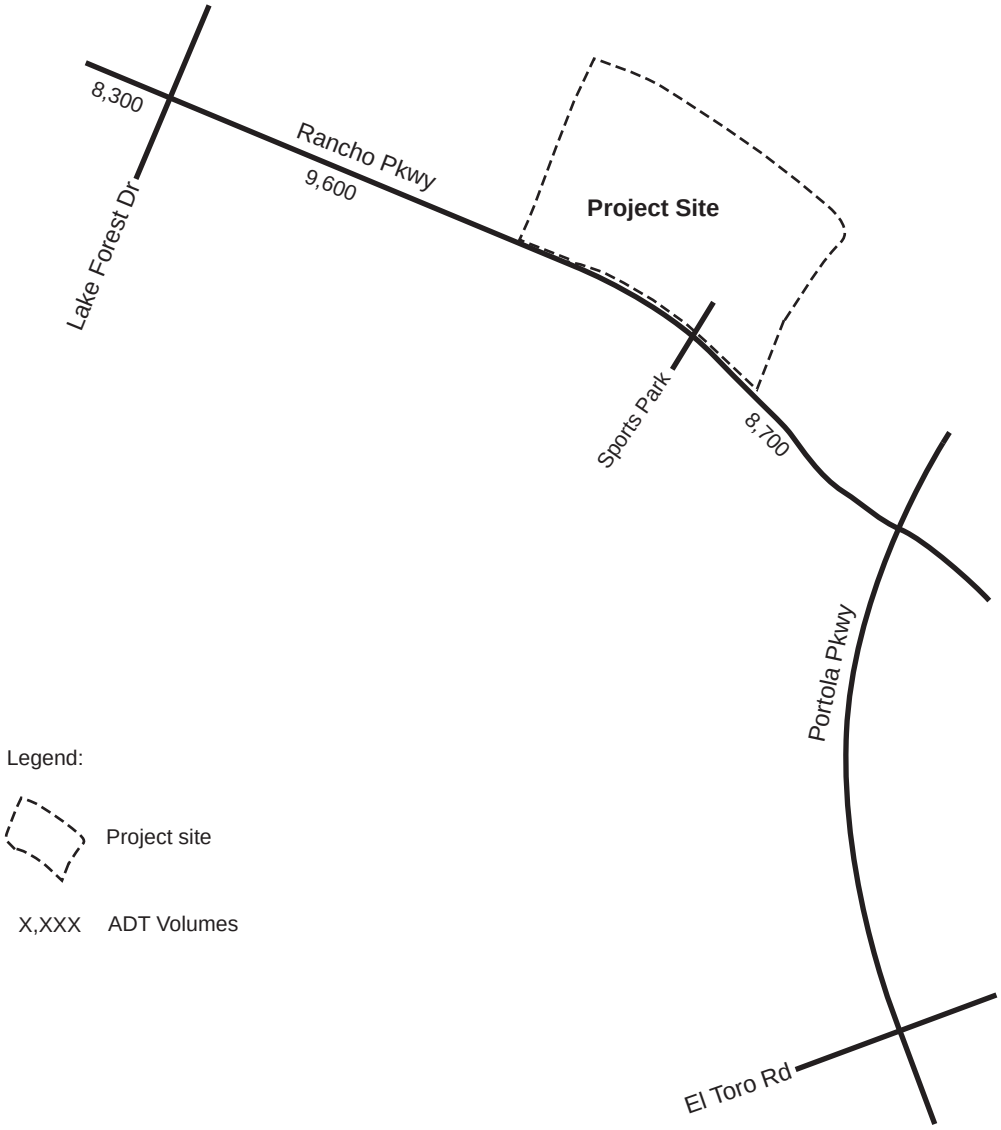
Notes: V/C = volume to capacity ratio; delay (in seconds) shown for informational purposes at unsignalized intersections only.

As shown in Table 5, with the addition of project generated trips, the study intersections are forecast to continue to operate at an acceptable LOS (LOS D or better) according to City of Lake Forest performance criteria for forecast existing plus project conditions.

As also shown in Table 5, based on City of Lake Forest established thresholds of significance, the addition of project-generated trips is forecast to result in no significant impacts at the study intersections for forecast existing plus project conditions.

FORECAST YEAR 2015 WITHOUT PROJECT CONDITIONS

To determine potential traffic impacts of the proposed project at the planned 2015 opening year, forecast year 2015 without project conditions are examined prior to forecast year 2015 with project conditions. It is assumed that the currently allocated commercial land use will not be



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Forecast Existing Plus Project Conditions Roadway Segment ADT Volumes

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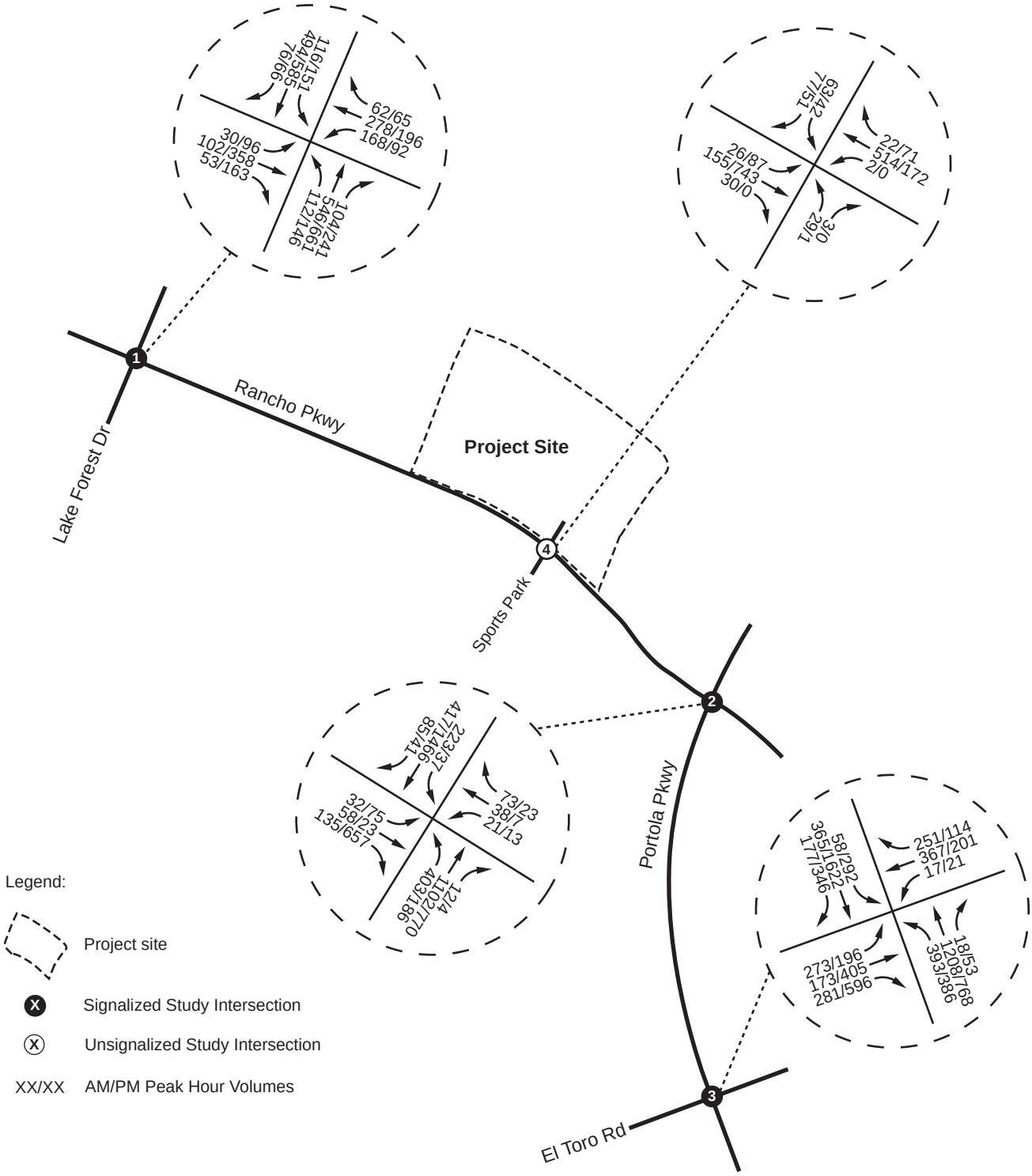
SEP/2013

Exhibit 12



Not to Scale

RBF A Baker Company

Forecast Existing Plus Project Conditions AM/PM Peak Hour Study Intersection Volumes

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SEP/2013

Exhibit 13

generating trips by year 2015 and the project site will continue to generate trips from the existing yard uses. This is a conservative assumption because the net trip generation between the proposed project and the yard uses is greater than the net trip generation between the proposed project and the allocated commercial land use.

The Sports Park and Recreation Center Traffic Study (*Austin-Foust Associates, Inc.,* March 2010) indicates that a traffic signal is likely to be warranted at the Sports Park/Rancho Parkway intersection by the Sports Park opening year in 2015.

Forecast year 2015 without project conditions assumes the following improvements within the study area are installed as part of the Sports Park project currently under construction:

- **Sports Park/Rancho Parkway** – A new traffic signal is assumed to be installed at the Sports Park/Rancho Parkway intersection.

Exhibits 14 and 15 show forecast year 2015 without project conditions ADT and a.m. and p.m. peak hour volumes at the study intersections as provided by the City of Lake Forest.

Forecast Year 2015 Without Project Conditions Intersection Peak Hour Level of Service

Table 6 summarizes forecast year 2015 without project conditions a.m. peak hour and p.m. peak hour LOS of the study intersections; detailed LOS analysis sheets are contained in Appendix A.

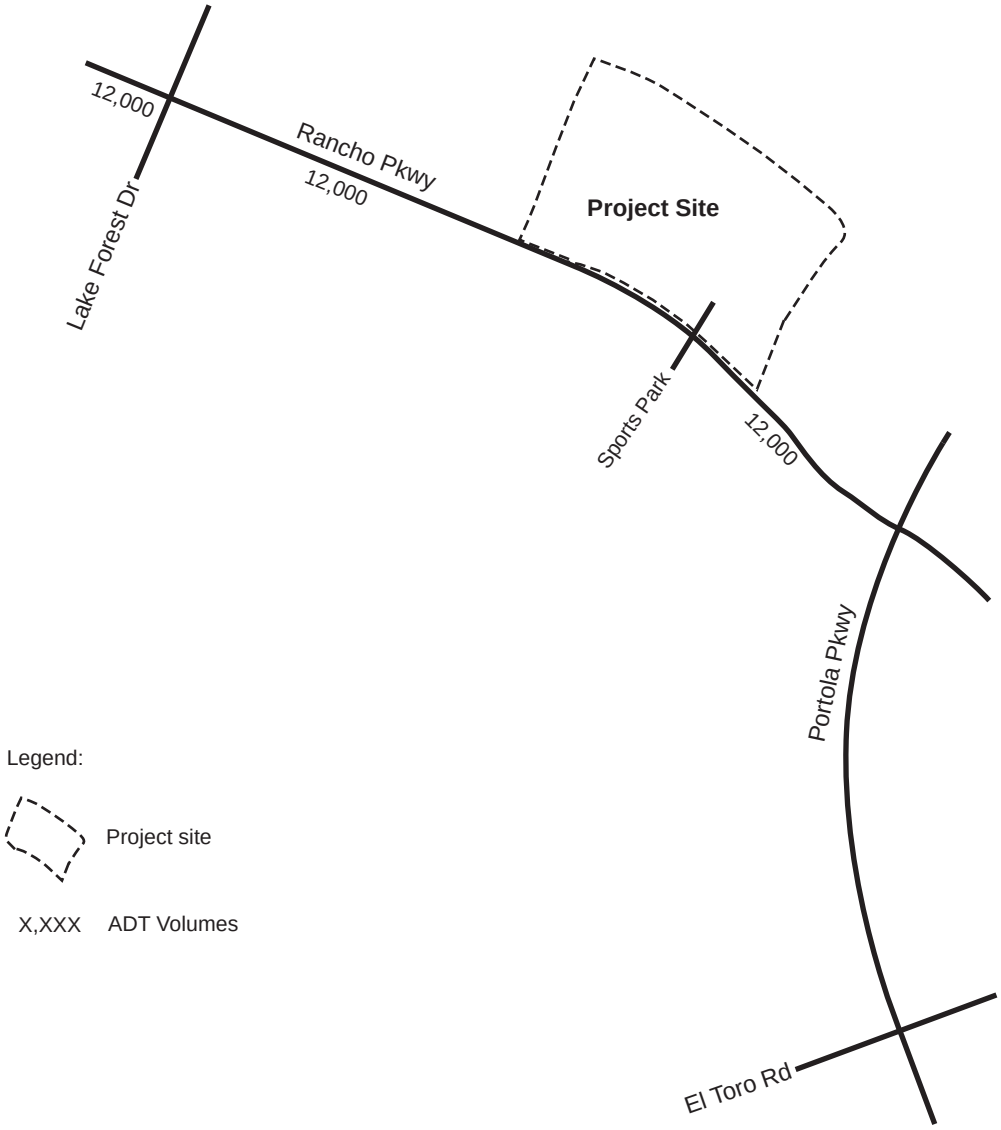
Table 6
Forecast Year 2015 Without Project Conditions
AM & PM Peak Hour Intersection LOS

Study Intersection	V/C – LOS	
	AM Peak Hour	PM Peak Hour
1. Lake Forest Dr / Rancho Pkwy	0.61 – B	0.85 – D
2. Portola Pkwy / Rancho Pkwy	0.52 – A	0.50 – A
3. Portola Pkwy / El Toro Rd	0.66 – B	**0.96 – E**
4. Sports Park / Rancho Pkwy	0.37 – A	0.51 – A

Notes: V/C = volume to capacity ratio; **bold** = deficient operation.

As shown in Table 6, the study intersections are forecast to continue to operate at an acceptable LOS (LOS D or better) according to City of Lake Forest performance criteria for forecast year 2015 without project conditions with the exception of the following intersection:

- Portola Parkway/El Toro Road (p.m. peak hour only).



Not to Scale

RBF
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Forecast Year 2015 Without Project Conditions Roadway Segment ADT Volumes

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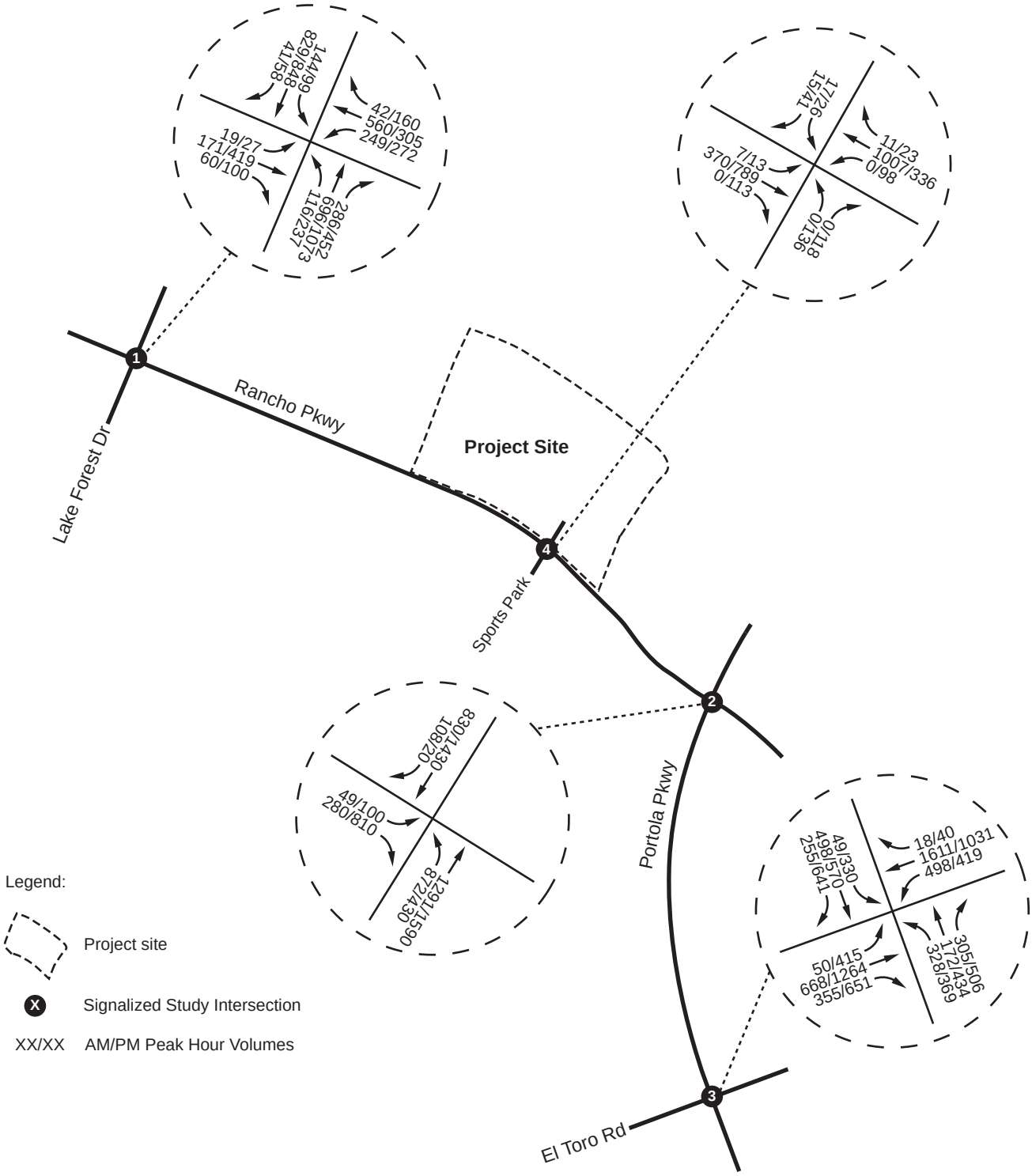
SEP/2013

Exhibit 14



Not to Scale

RBF
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Forecast Year 2015 Without Project Conditions AM/PM Peak Hour Study Intersection Volumes

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SEP/2013

Exhibit 15

FORECAST YEAR 2015 WITH PROJECT CONDITIONS

This section analyzes the potential impact of the addition of trips forecast to be generated by the proposed project to forecast year 2015 without project conditions.

Forecast Year 2015 With Project Conditions Traffic Volumes

Forecast year 2015 with project conditions a.m. and p.m. peak hour volumes were derived by adding forecast project-generated trips to forecast year 2015 without project conditions traffic volumes.

Exhibits 16 and 17 show forecast year 2015 with project conditions ADT and a.m. and p.m. peak hour volumes at the study intersections.

Forecast Year 2015 With Project Conditions Intersection Peak Hour Level of Service

Table 7 summarizes forecast year 2015 with project conditions a.m. peak hour and p.m. peak hour LOS of the study intersections; detailed LOS analysis sheets are contained in Appendix A.

Table 7
Forecast Year 2015 With Project Conditions
AM & PM Peak Hour Intersection LOS

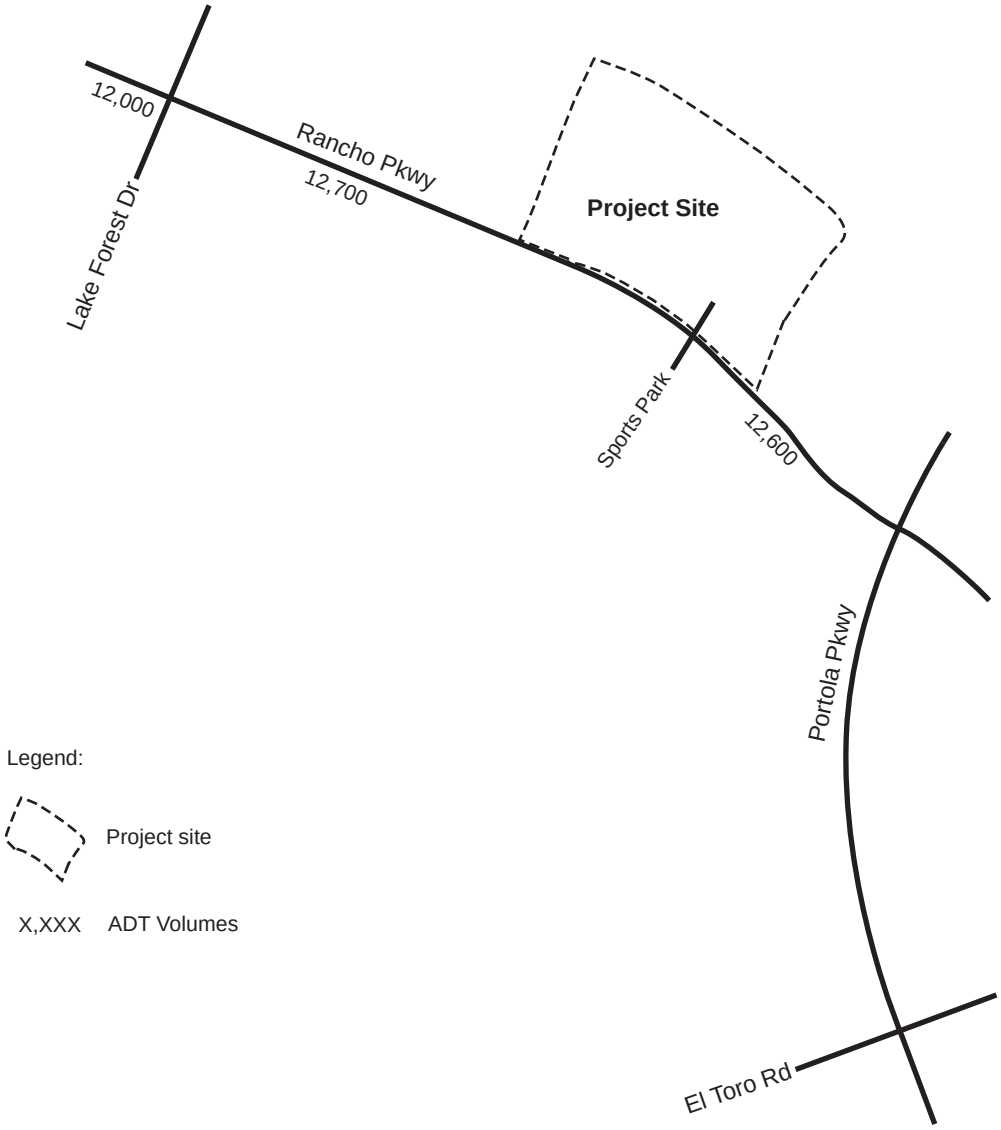
Study Intersection	Forecast Year 2015 Without Project Conditions		Forecast Year 2015 With Project Conditions		Change in V/C		Significant Impact?
	V/C – LOS		V/C – LOS		AM Peak Hour	PM Peak Hour	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour			
1. Lake Forest Dr / Rancho Pkwy	0.61 – B	0.85 – D	0.63 – B	0.85 – D	0.02	0.00	No
2. Portola Pkwy / Rancho Pkwy	0.52 – A	0.50 – A	0.53 – A	0.51 – A	0.01	0.01	No
3. Portola Pkwy / El Toro Rd	0.66 – B	**0.96 – E**	0.67 – B	**0.97 – E**	0.01	0.01	No
4. Sports Park / Rancho Pkwy	0.37 – A	0.51 – A	0.44 – A	0.52 – A	0.07	0.01	No

Notes: V/C = volume to capacity ratio; **bold** = deficient operation.

As shown in Table 7, with the addition of project-generated trips, the study intersections are forecast to continue to operate at an acceptable LOS (LOS D or better) according to City of Lake Forest performance criteria for forecast year 2015 with project conditions with the exception of the following intersection:

- Portola Parkway/El Toro Road (p.m. peak hour only).

As also shown in Table 7, based on City of Lake Forest established thresholds of significance, the addition of project-generated trips is forecast to result in no significant impacts at the study intersections for forecast year 2015 with project conditions.



Not to Scale

RBF
A Baker Company

Forecast Year 2015 With Project Conditions Roadway Segment ADT Volumes

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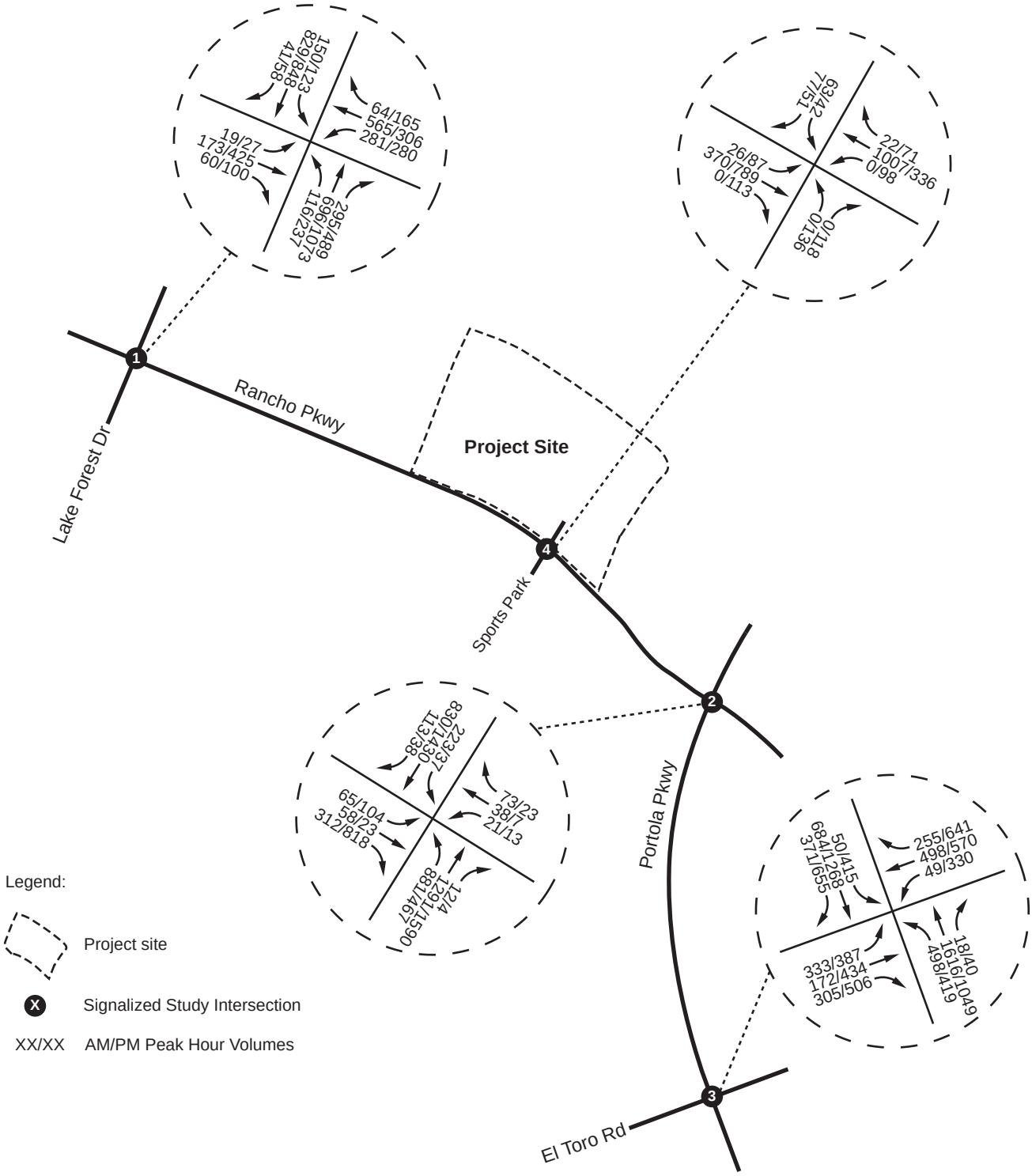
SEP/2013

Exhibit 16



Not to Scale

RBF A Baker Company

Forecast Year 2015 With Project Conditions AM/PM Peak Hour Study Intersection Volumes

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SEP/2013

Exhibit 17

FORECAST YEAR 2030 WITHOUT PROJECT CONDITIONS

To determine potential traffic impacts of the proposed project at forecast year 2030 conditions, forecast year 2030 without project conditions are examined prior to forecast year 2030 with project conditions. It is assumed that the City traffic model forecast data for the project site includes trips generated by the currently allocated commercial land use.

Forecast year 2030 without project conditions assumes the following improvements within the study area are installed as identified in the Lake Forest Traffic Analysis Model:

- **Lake Forest Drive/Rancho Parkway** – Restripe the westbound approach to consist of two left-turn lanes, two through lanes, and one de facto right turn lane; add a second eastbound through lane; and add a second southbound left-turn lane.

- **Portola Parkway/El Toro Road** – Add a second eastbound (El Toro Road) left-turn lane; and add a second westbound (El Toro Road) right-turn lane.

Exhibits 18 and 19 show forecast year 2030 without project conditions ADT and a.m. and p.m. peak hour volumes at the study intersections as provided by the City of Lake Forest.

Forecast Year 2030 Without Project Conditions Intersection Peak Hour Level of Service

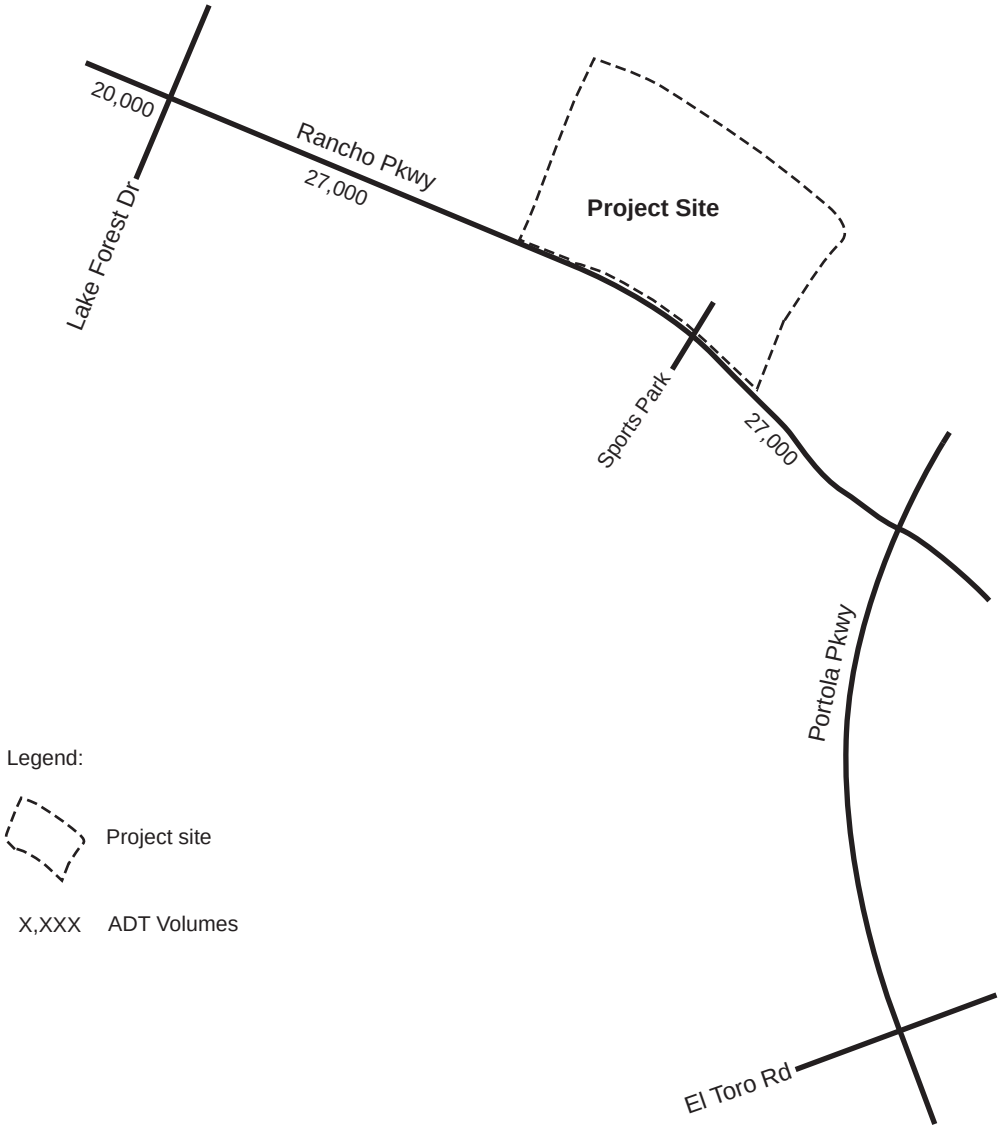
Table 8 summarizes forecast year 2030 without project conditions a.m. peak hour and p.m. peak hour LOS of the study intersections; detailed LOS analysis sheets are contained in Appendix A.

Table 8
Forecast Year 2030 Without Project Conditions
AM & PM Peak Hour Intersection LOS

Study Intersection	V/C – LOS	
	AM Peak Hour	PM Peak Hour
1. Lake Forest Dr / Rancho Pkwy	0.66 – B	0.83 – D
2. Portola Pkwy / Rancho Pkwy	0.62 – B	0.62 – B
3. Portola Pkwy / El Toro Rd	0.70 – B	0.86 – D
4. Sports Park / Rancho Pkwy	0.65 – B	0.86 – D

Notes: V/C = volume to capacity ratio.

As shown in Table 8, the study intersections are forecast to continue to operate at an acceptable LOS (LOS D or better) according to City of Lake Forest performance criteria for forecast year 2030 without project conditions.



Not to Scale

RBF
A Baker Company

Forecast Year 2030 Without Project Conditions Roadway Segment ADT Volumes

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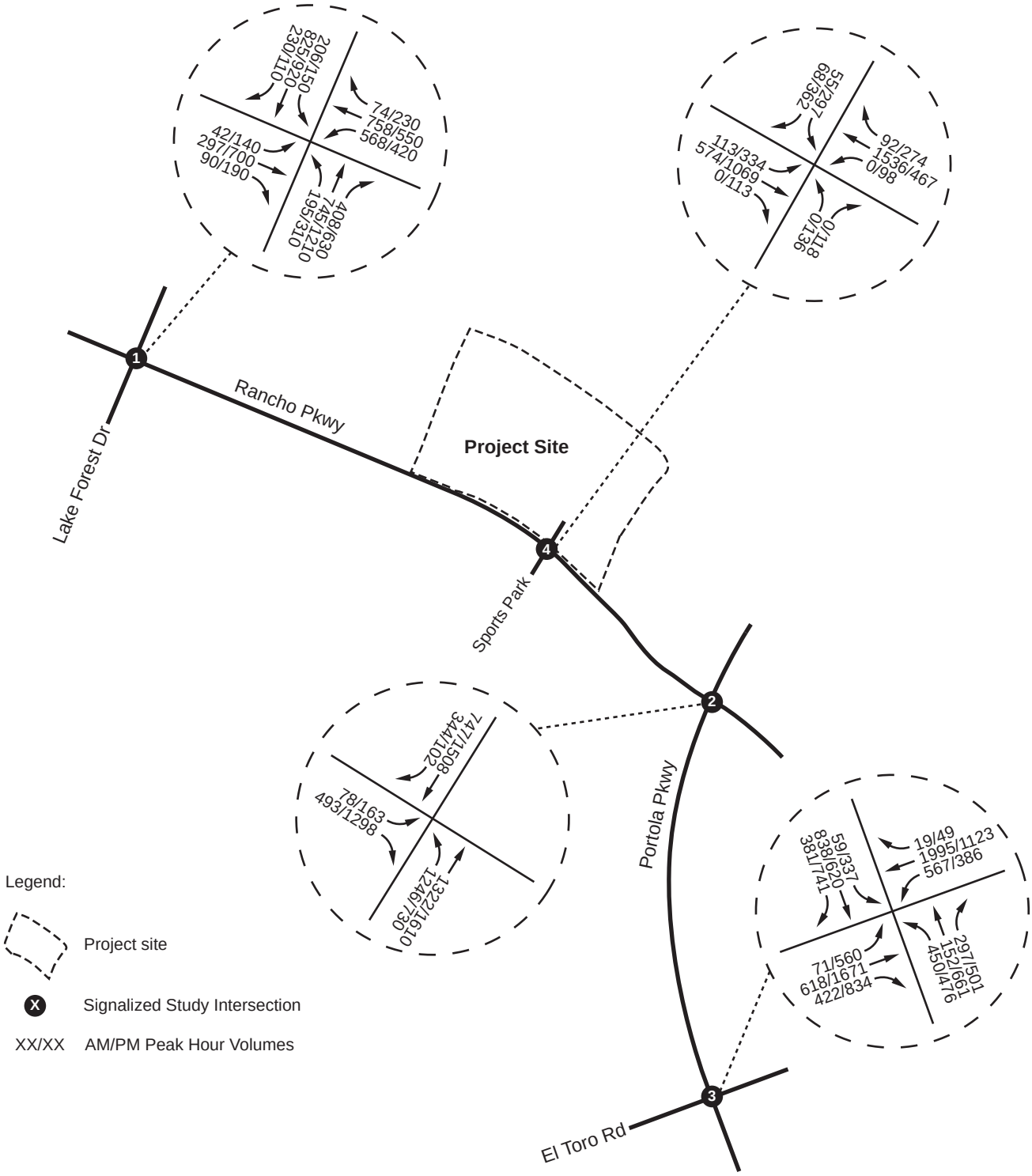
SEP/2013

Exhibit 18



Not to Scale

RBF A Baker Company

Forecast Year 2030 Without Project Conditions AM/PM Peak Hour Study Intersection Volumes

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SEP/2013

Exhibit 19

FORECAST YEAR 2030 WITH PROJECT CONDITIONS

This section analyzes the potential impact of the addition of trips forecast to be generated by the proposed project to forecast year 2030 without project conditions.

Forecast Year 2030 With Project Conditions Traffic Volumes

Forecast year 2030 with project conditions a.m. and p.m. peak hour volumes were derived by adding forecast project-generated trips to forecast year 2030 without project conditions traffic volumes.

Exhibits 20 and 21 show forecast year 2030 with project conditions ADT and a.m. and p.m. peak hour volumes at the study intersections.

Forecast Year 2030 With Project Conditions Intersection Peak Hour Level of Service

Table 9 summarizes forecast year 2030 with project conditions a.m. peak hour and p.m. peak hour LOS of the study intersections; detailed LOS analysis sheets are contained in Appendix A.

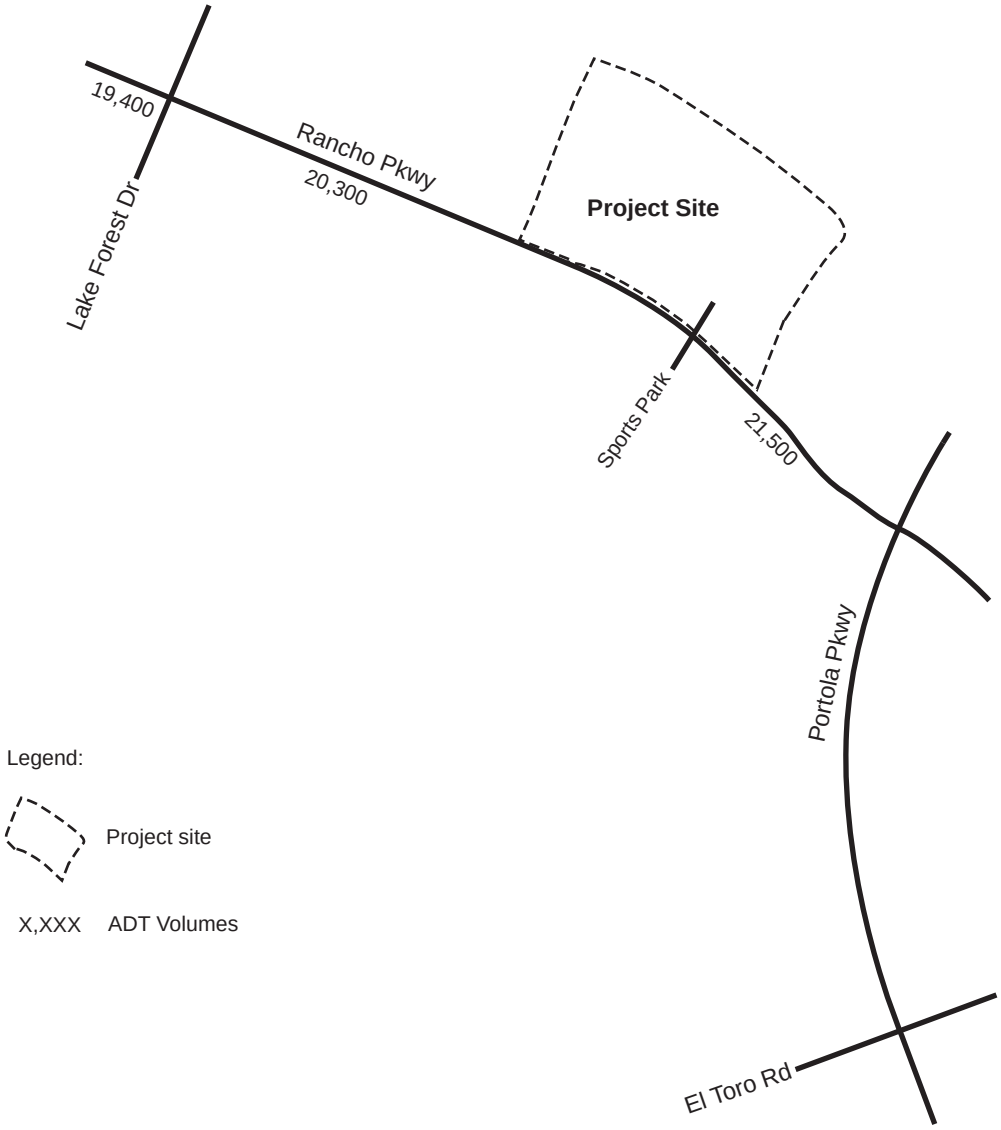
Table 9
Forecast Year 2030 With Project Conditions
AM & PM Peak Hour Intersection LOS

Study Intersection	Forecast Year 2030 Without Project Conditions		Forecast Year 2030 With Project Conditions		Change in V/C		Significant Impact?
	V/C – LOS		V/C – LOS		AM Peak Hour	PM Peak Hour	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour			
1. Lake Forest Dr / Rancho Pkwy	0.66 – B	0.83 – D	0.66 – B	0.78 – C	0.00	-0.05	No
2. Portola Pkwy / Rancho Pkwy	0.62 – B	0.62 – B	0.61 – B	0.56 – A	-0.01	-0.06	No
3. Portola Pkwy / El Toro Rd	0.70 – B	0.86 – D	0.69 – B	0.82 – D	-0.01	-0.04	No
4. Sports Park / Rancho Pkwy	0.65 – B	0.86 – D	0.59 – A	0.60 – A	-0.06	-0.26	No

Notes: V/C = volume to capacity ratio.

As shown in Table 9, with the addition of project-generated trips, the study intersections are forecast to continue to operate at an acceptable LOS (LOS D or better) according to City of Lake Forest performance criteria for forecast year 2030 with project conditions.

As also shown in Table 9, based on City of Lake Forest established thresholds of significance, the addition of project-generated trips is forecast to result in no significant impacts at the study intersections for forecast year 2030 with project conditions.



Not to Scale

RBF
A Baker Company

Forecast Year 2030 With Project Conditions Roadway Segment ADT Volumes

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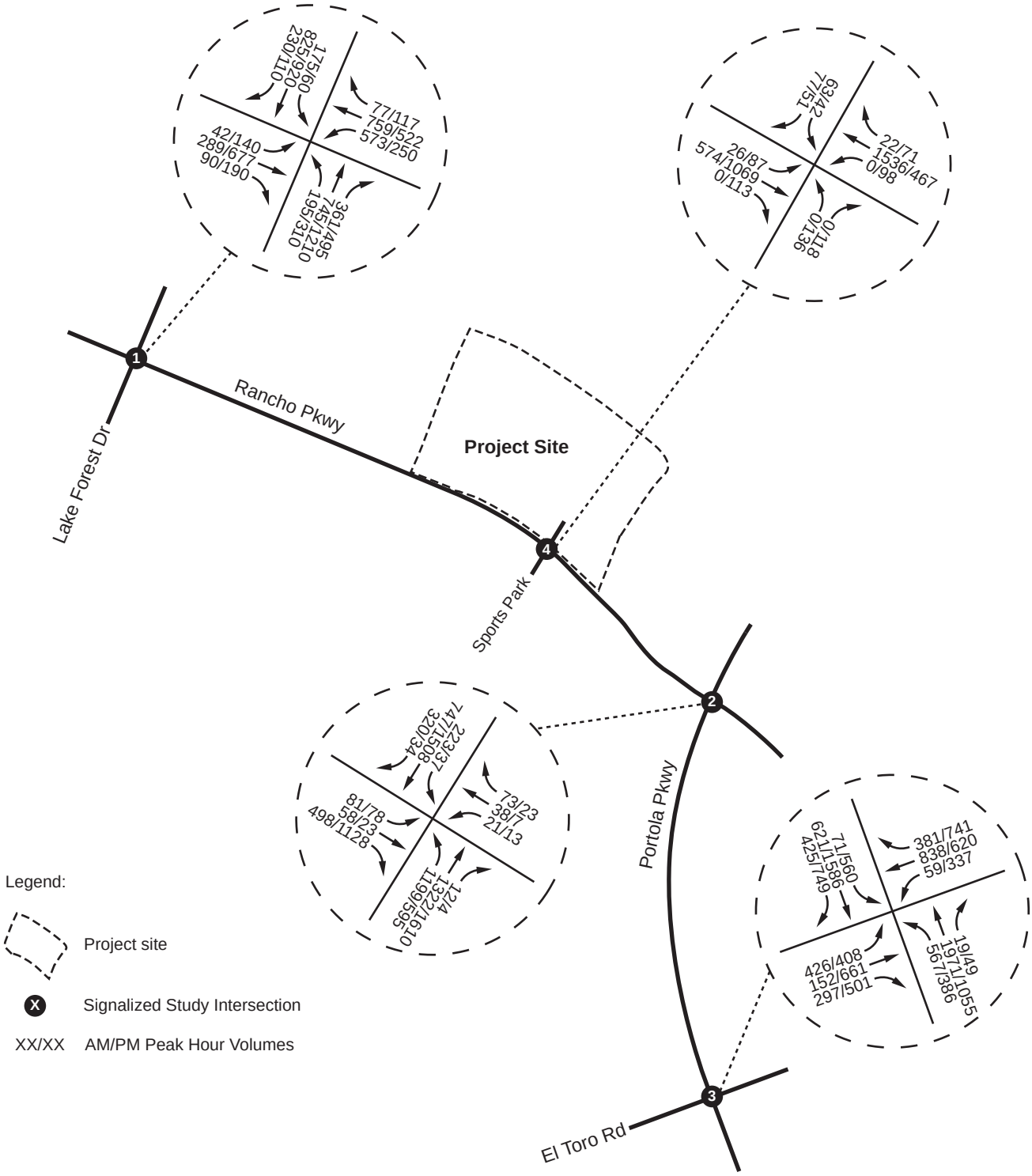
SEP/2013

Exhibit 20



Not to Scale

RBF A Baker Company

Forecast Year 2030 With Project Conditions AM/PM Peak Hour Study Intersection Volumes

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SEP/2013

Exhibit 21

MITIGATION MEASURES

Since no significant traffic impacts are forecast to occur as a result of the proposed project, no traffic mitigation measures are required for the proposed project.

CONCLUSIONS

For existing plus project conditions, the net trip generation of the proposed project in addition to the number of trips presently generated by the existing yard uses, is approximately 1,350 trips, which includes approximately 138 a.m. peak hour trips and approximately 148 p.m. peak hour trips

For year 2015 with project conditions, the net trip generation of the proposed project in addition to the number of trips presently generated by the existing yard uses, is approximately 1,350 trips, which includes approximately 138 a.m. peak hour trips and approximately 148 p.m. peak hour trips (same as existing plus project conditions).

For year 2030 with project conditions, the net trip generation of the proposed project replacing the currently allocated commercial land use, is approximately 12,200 fewer trips, which includes approximately 140 fewer a.m. peak hour trips and approximately 1,016 fewer p.m. peak hour trips. So if the proposed project replaces the allocated commercial use, the four intersections analyzed would see a reduction in their volume to capacity ratios.

Based on City of Lake Forest thresholds of significance, the addition of project-generated trips is forecast to result in no significant impacts at the study intersections for the evaluated analysis scenarios.

No traffic mitigation measures are required for the proposed project since no significant traffic impacts are forecast to occur as a result of the proposed project. Table 10 summarizes the intersection LOS results for the evaluated analysis scenarios.

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Table 10
Summary of AM & PM Peak Hour Study Intersection LOS

Study Intersection	Existing Conditions		Forecast Existing Plus Project Conditions		Forecast Year 2015 Without Project Conditions		Forecast Year 2015 With Project Conditions		Forecast Year 2030 Without Project Conditions		Forecast Year 2030 With Project Conditions		Significant Impact?
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour	
	V/C (Delay) – LOS	V/C (Delay) – LOS	V/C (Delay) – LOS	V/C (Delay) – LOS	V/C – LOS	V/C – LOS	V/C – LOS	V/C – LOS	V/C – LOS	V/C – LOS	V/C – LOS	V/C – LOS	
1. Lake Forest Dr / Rancho Pkwy	0.40 – A	0.56 – A	0.44 – A	0.60 – A	0.61 – B	0.85 – D	0.63 – B	0.85 – D	0.66 – B	0.83 – D	0.66 – B	0.78 – C	No
2. Portola Pkwy / Rancho Pkwy	0.39 – A	0.41 – A	0.39 – A	0.43 – A	0.52 – A	0.50 – A	0.53 – A	0.51 – A	0.62 – B	0.62 – B	0.61 – B	0.56 – A	No
3. Portola Pkwy / El Toro Rd	0.51 – A	0.64 – B	0.52 – A	0.65 – B	0.66 – B	**0.96 – E**	0.67 – B	**0.97 – E**	0.70 – B	0.86 – D	0.69 – B	0.82 – D	No
4. Sports Park / Rancho Pkwy	(13.3) – B	(18.7) – C	(15.3) – C	(25.3) – D	0.37 – A	0.51 – A	0.44 – A	0.52 – A	0.65 – B	0.86 – D	0.59 – A	0.60 – A	No

Notes: V/C = volume to capacity ratio; delay (in seconds) shown for informational purposes at unsignalized intersections only; **bold** = deficient operation.

APPENDIX A
LFTAM Traffic Forecast Data

414 . Ridge Route Dr. at Jeronimo Rd.

2017 With-Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	1	1700	173	.10*	60	.04
NBT	2	3400	259	.08	320	.09*
NBR	d	1700	69	.04	120	.07
SBL	1	1700	22	.01	90	.05*
SBT	2	3400	230	.07*	200	.06
SBR	d	1700	20	.01	40	.02
EBL	1	1700	129	.08	60	.04
EBT	2	3400	642	.22*	980	.31*
EBR	0	0	89		70	
WBL	1	1700	12	.01*	80	.05*
WBT	2	3400	418	.14	350	.13
WBR	0	0	41		100	
Clearance Interval				.05*		.05*

TOTAL CAPACITY UTILIZATION .45 .55

415 . Glenn Ranch Rd. at Portola Pkwy.

2017 With-Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	1	1700	61	.04	101	.06
NBT	2	3400	20	.01*	19	.01*
NBR	0	0	29	.02	57	.03
SBL	2	3400	480	.14*	332	.10*
SBT	2	3400	49	.01	20	.01
SBR	f		929		686	
EBL	2	3400	459	.14*	1061	.31*
EBT	3	5100	560	.11	1512	.30
EBR	1	1700	40	.02	71	.04
WBL	2	3400	94	.03	59	.02
WBT	3	5100	1356	.27*	753	.15*
WBR	1	1700	48	.03	370	.22
Clearance Interval				.05*		.05*

Note: Assumes Right-Turn Overlap for WBR

TOTAL CAPACITY UTILIZATION .61 .62

416 . Portola Pkwy .East at SR-241 Ramps

2017 With-Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	2	3400	613	.18*	311	.09
NBT	3	5100	853	.17	895	.18*
NBR	f		29		103	
SBL	2	3400	221	.07	893	.26*
SBT	2	3400	646	.19*	1031	.30
SBR	f		267		79	
EBL	1	1700	104	.06*	174	.10*
EBT	0	0	0		0	
EBR	f		267		446	
WBL	2	3400	107	.03	33	.01
WBT	0	0	0		0	
WBR	f		1544		326	
Clearance Interval				.05*		.05*

TOTAL CAPACITY UTILIZATION .48 .59

417 . El Toro Rd. at Portola Pkwy./S. Margarita Pkwy.

2017 With-Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	1	1700	328	.19*	369	.22*
NBT	3	5100	172	.03	434	.09
NBR	f		305		506	
SBL	1	1700	49	.03	330	.19
SBT	3	5100	498	.10*	570	.11*
SBR	1	1700	255	.15	641	.38
EBL	2	3400	50	.01	415	.12
EBT	3	5100	668	.13*	1264	.25*
EBR	1	1700	355	.21	651	.38
WBL	2	3400	498	.15*	419	.12*
WBT	4	6800	1611	.24	1031	.15
WBR	d	1700	18	.01	40	.02
Right Turn Adjustment			SBR	.02*	SBR	.10*
Clearance Interval				.05*		.05*

TOTAL CAPACITY UTILIZATION .64 .85

516 . Lake Forest Dr. at Rancho Pkwy.

2017 With-Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	1	1700	116	.07*	237	.14*
NBT	2	3400	696	.20	1073	.32
NBR	d	1700	286	.17	452	.27
SBL	1	1700	144	.08	99	.06
SBT	2	3400	829	.24*	848	.25*
SBR	d	1700	41	.02	58	.03
EBL	1	1700	19	.01	27	.02
EBT	1	1700	171	.10*	419	.25*
EBR	1	1700	60	.04	100	.06
WBL	1	1700	249	.15*	272	.16*
WBT	2	3400	560	.16	305	.09
WBR	1	1700	42	.02	160	.09
Clearance Interval				.05*		.05*
TOTAL CAPACITY UTILIZATION				**.61**		**.85**

517 . Portola Pkwy. at Rancho Pkwy.

2017 With-Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	2	3400	872	.26*	430	.13*
NBT	4	6800	1291	.19	1590	.23
NBR	0	0	0		0	
SBL	0	0	0		0	
SBT	4	6800	830	.12*	1430	.21*
SBR	d	1700	108	.06	20	.01
EBL	1.5		49	.01*	100	.06*
EBT	0	5100	0		0	
EBR	1.5		280		810	.24
WBL	0	0	0		0	
WBT	0	0	0		0	
WBR	0	0	0		0	
Right Turn Adjustment					EBR	.08*
Clearance Interval				.05*		.05*
TOTAL CAPACITY UTILIZATION				**.44**		**.53**

518 . Alton Pkwy. at Commercentre

2017 With-Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	0	0	0		0	
NBT	3	5100	918	.18	1974	.39*
NBR	d	1700	352	.21	270	.16
SBL	1	1700	148	.09	111	.07*
SBT	3	5100	2222	.44*	1225	.24
SBR	0	0	0		0	
EBL	0	0	0		0	
EBT	0	0	0		0	
EBR	0	0	0		0	
WBL	1.5		148	.04*	489	.14*
WBT	0	5100	0		0	
WBR	1.5		52		161	.09
Clearance Interval				.05*		.05*
TOTAL CAPACITY UTILIZATION				**.53**		**.65**

520 . Keystone at Trabuco Rd.

2017 With-Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	0	0	0		0	
NBT	0	0	0		0	
NBR	0	0	0		0	
SBL	2	3400	169	.05*	63	.02*
SBT	0	0	0		0	
SBR	1	1700	261	.15	116	.07
EBL	2	3400	133	.04*	267	.08*
EBT	2	3400	629	.19	777	.23
EBR	0	0	0		0	
WBL	0	0	0		0	
WBT	2	3400	739	.22*	604	.18*
WBR	1	1700	48	.03	123	.07
Right Turn Adjustment			SBR	.07*		
Clearance Interval				.05*		.05*
TOTAL CAPACITY UTILIZATION				**.43**		**.33**

415 . Glenn Ranch Rd. at Portola Pkwy.

2030 With-Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	1	1700	60	.04	70	.04
NBT	2	3400	20	.01*	20	.01*
NBR	0	0	30	.02	90	.05
SBL	2	3400	410	.12*	380	.11*
SBT	2	3400	50	.01	20	.01
SBR	f		910		750	
EBL	2	3400	450	.13*	1110	.33*
EBT	3	5100	520	.10	1880	.37
EBR	1	1700	20	.01	70	.04
WBL	2	3400	130	.04	50	.01
WBT	3	5100	1710	.34*	850	.17*
WBR	1	1700	110	.06	300	.18
Clearance Interval				.05*		.05*

Note: Assumes Right-Turn Overlap for WBR

TOTAL CAPACITY UTILIZATION .65 .67

416 . Portola Pkwy .East at SR-241 Ramps

2030 With-Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	2	3400	580	.17*	310	.09
NBT	3	5100	910	.18	840	.16*
NBR	f		80		220	
SBL	2	3400	250	.07	1210	.36*
SBT	2	3400	510	.15*	1060	.31
SBR	f		250		130	
EBL	1	1700	240	.14*	170	.10*
EBT	0	0	0		0	
EBR	f		290		450	
WBL	2	3400	380	.11	170	.05
WBT	0	0	0		0	
WBR	f		1810		410	
Clearance Interval				.05*		.05*

TOTAL CAPACITY UTILIZATION .51 .67

417 . El Toro Rd. at Portola Pkwy./S. Margarita

2030 With-Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	1	1700	450	.26*	476	.28*
NBT	3	5100	152	.03	661	.13
NBR	f		297		501	
SBL	1	1700	59	.03	337	.20
SBT	3	5100	838	.16*	620	.12*
SBR	1	1700	381	.22	741	.44
EBL	2	3400	71	.02*	560	.16
EBT	3	5100	618	.12	1671	.33*
EBR	1	1700	422	.25	834	.49
WBL	2	3400	567	.17	386	.11*
WBT	4	6800	1995	.29*	1123	.17
WBR	d	1700	19	.01	49	.03
Right Turn Adjustment			SBR	.04*	SBR	.12*
Clearance Interval				.05*		.05*

TOTAL CAPACITY UTILIZATION .82 1.01

418 . El Toro Rd. at Trabuco Rd.

2030 With-Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	2	3400	338	.10*	442	.13
NBT	3	5100	1162	.23	1475	.29*
NBR	1	1700	129	.08	634	.37
SBL	2	3400	269	.08	271	.08*
SBT	3	5100	1742	.34*	1020	.20
SBR	1	1700	489	.29	179	.11
EBL	2	3400	183	.05*	816	.24*
EBT	3	5100	344	.10	1285	.28
EBR	0	0	284	.17	159	
WBL	2	3400	291	.09	220	.06
WBT	3	5100	1210	.24*	559	.11*
WBR	1	1700	240	.14	159	.09
Right Turn Adjustment					NBR	.01*
Clearance Interval				.05*		.05*

Note: Assumes Right-Turn Overlap for SBR NBR

TOTAL CAPACITY UTILIZATION .78 .78

515 . Bake Pkwy. N at Rancho Pkwy.

2030 With-Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	0	0	0		0	
NBT	2	3400	702	.21	1650	.49*
NBR	d	1700	549	.32	660	.39
SBL	1	1700	111	.07	200	.12*
SBT	2	3400	1558	.46*	820	.24
SBR	0	0	0		0	
EBL	0	0	0		0	
EBT	0	0	0		0	
EBR	0	0	0		0	
WBL	2	3400	491	.14*	670	.20*
WBT	0	0	0		0	
WBR	2	3400	49	.01	250	.07
Clearance Interval				.05*		.05*

TOTAL CAPACITY UTILIZATION .65 .86

516 . Lake Forest Dr. at Rancho Pkwy.

2030 With-Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	1	1700	195	.11*	310	.18*
NBT	2	3400	745	.22	1210	.36
NBR	d	1700	408	.24	630	.37
SBL	1	1700	206	.12	150	.09
SBT	2	3400	825	.24*	920	.27*
SBR	d	1700	230	.14	110	.06
EBL	1	1700	42	.02	140	.08
EBT	1	1700	297	.17*	700	.41*
EBR	1	1700	90	.05	190	.11
WBL	1	1700	568	.33*	420	.25*
WBT	2	3400	758	.22	550	.16
WBR	1	1700	74	.04	230	.14
Clearance Interval				.05*		.05*

TOTAL CAPACITY UTILIZATION .90 1.16

517 . Portola Pkwy. at Rancho Pkwy.

2030 With-Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	2	3400	1246	.37*	730	.21*
NBT	4	6800	1322	.19	1610	.24
NBR	0	0	0		0	
SBL	0	0	0		0	
SBT	4	6800	747	.11*	1508	.22*
SBR	d	1700	344	.20	102	.06
EBL	1.5		78	.02*	163	.10*
EBT	0	5100	0		0	
EBR	1.5		493	.15	1298	.38
WBL	0	0	0		0	
WBT	0	0	0		0	
WBR	0	0	0		0	
Right Turn Adjustment			SBR	.07*	EBR	.12*
Clearance Interval				.05*		.05*

TOTAL CAPACITY UTILIZATION .62 .70

518 . Alton Pkwy. at Commercentre

2030 With-Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	0	0	0		0	
NBT	3	5100	1118	.22	2536	.50*
NBR	d	1700	350	.21	210	.12
SBL	1	1700	228	.13	140	.08*
SBT	3	5100	2733	.54*	1616	.32
SBR	0	0	0		0	
EBL	0	0	0		0	
EBT	0	0	0		0	
EBR	0	0	0		0	
WBL	1.5		131	.04*	434	.13*
WBT	0	5100	0		0	
WBR	1.5		79	{.00}	234	{.08}
Clearance Interval				.05*		.05*

TOTAL CAPACITY UTILIZATION .63 .76

APPENDIX B
Existing Count Data

Transportation Studies, Inc.
2640 Walnut Avenue, Suite H
Tustin, CA. 92780

City: LAKE FOREST
N-S Direction: LAKE FOREST DRIVE
E-W Direction: RANCHO PARKWAY-NORTH

File Name : H1305053
Site Code : 516
Start Date : 5/30/2013
Page No : 1

Groups Printed- Turning Movements

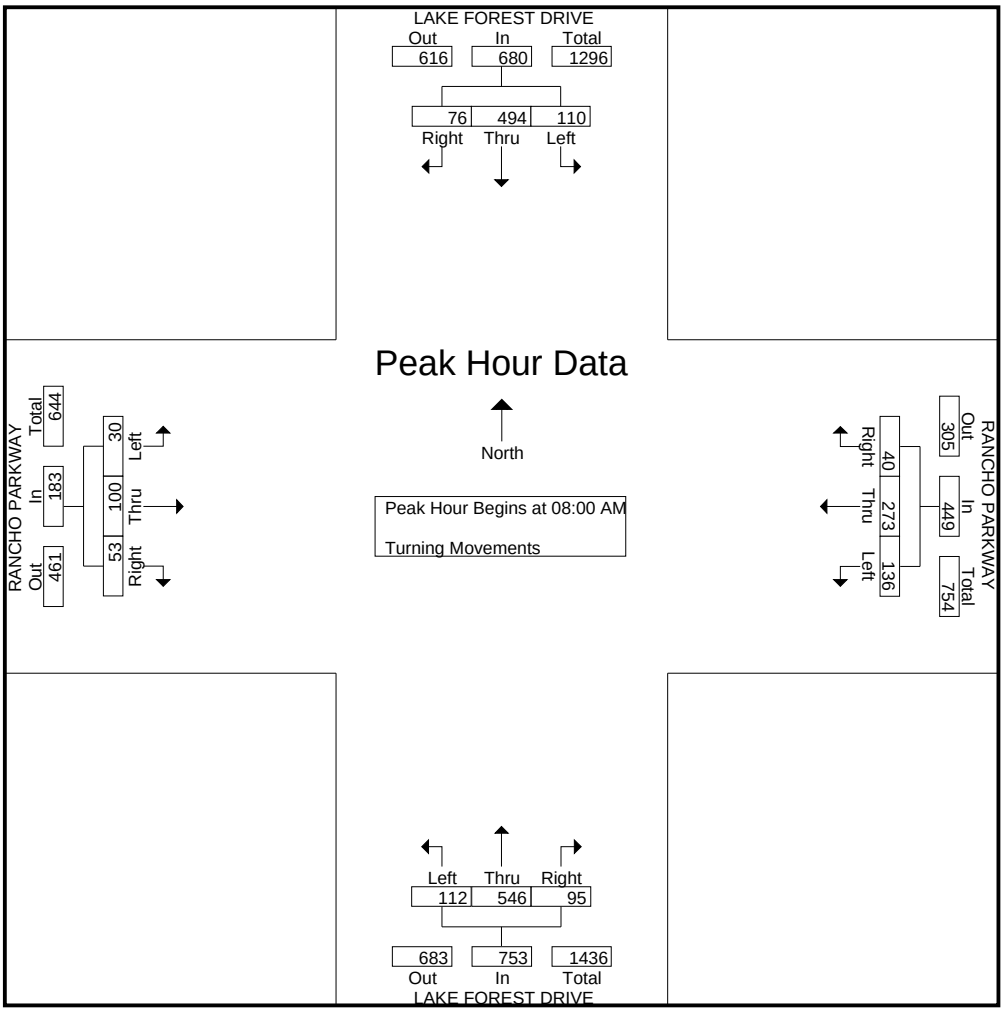
	LAKE FOREST DRIVE Southbound			RANCHO PARKWAY Westbound			LAKE FOREST DRIVE Northbound			RANCHO PARKWAY Eastbound			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
07:00 AM	17	76	14	5	38	18	17	89	18	14	25	3	334
07:15 AM	7	98	8	2	50	30	20	97	12	9	7	4	344
07:30 AM	14	130	11	8	55	22	14	109	20	12	25	4	424
07:45 AM	17	130	18	6	62	36	20	118	27	8	26	10	478
Total	55	434	51	21	205	106	71	413	77	43	83	21	1580
08:00 AM	21	133	39	19	85	33	29	142	26	6	25	12	570
08:15 AM	15	133	15	11	77	40	25	145	27	18	27	6	539
08:30 AM	21	114	32	4	58	27	18	129	30	16	23	4	476
08:45 AM	19	114	24	6	53	36	23	130	29	13	25	8	480
Total	76	494	110	40	273	136	95	546	112	53	100	30	2065
*** BREAK ***													
04:00 PM	20	101	38	19	37	20	36	144	32	29	39	11	526
04:15 PM	11	118	17	5	48	26	51	167	38	30	41	11	563
04:30 PM	18	123	22	23	43	24	36	156	36	22	85	12	600
04:45 PM	19	124	29	16	40	25	37	152	40	28	77	17	604
Total	68	466	106	63	168	95	160	619	146	109	242	51	2293
05:00 PM	13	147	25	14	42	20	38	151	25	26	66	9	576
05:15 PM	17	177	37	11	49	24	70	187	37	45	101	44	799
05:30 PM	20	121	32	25	56	12	43	165	43	37	97	16	667
05:45 PM	16	140	33	10	48	28	53	158	41	55	88	27	697
Total	66	585	127	60	195	84	204	661	146	163	352	96	2739
Grand Total	265	1979	394	184	841	421	530	2239	481	368	777	198	8677
Apprch %	10	75	14.9	12.7	58.2	29.1	16.3	68.9	14.8	27.4	57.9	14.7	
Total %	3.1	22.8	4.5	2.1	9.7	4.9	6.1	25.8	5.5	4.2	9	2.3	

Transportation Studies, Inc.
2640 Walnut Avenue, Suite H
Tustin, CA. 92780

City: LAKE FOREST
N-S Direction: LAKE FOREST DRIVE
E-W Direction: RANCHO PARKWAY-NORTH

File Name : H1305053
Site Code : 516
Start Date : 5/30/2013
Page No : 2

	LAKE FOREST DRIVE Southbound				RANCHO PARKWAY Westbound				LAKE FOREST DRIVE Northbound				RANCHO PARKWAY Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	**21**	**133**	**39**	**193**	**19**	**85**	33	**137**	**29**	142	26	**197**	6	25	**12**	43	**570**
08:15 AM	15	133	15	163	11	77	**40**	128	25	**145**	27	197	**18**	**27**	6	**51**	539
08:30 AM	21	114	32	167	4	58	27	89	18	129	**30**	177	16	23	4	43	476
08:45 AM	19	114	24	157	6	53	36	95	23	130	29	182	13	25	8	46	480
Total Volume	76	494	110	680	40	273	136	449	95	546	112	753	53	100	30	183	2065
% App. Total	11.2	72.6	16.2		8.9	60.8	30.3		12.6	72.5	14.9		29	54.6	16.4		
PHF	.905	.929	.705	.881	.526	.803	.850	.819	.819	.941	.933	.956	.736	.926	.625	.897	.906

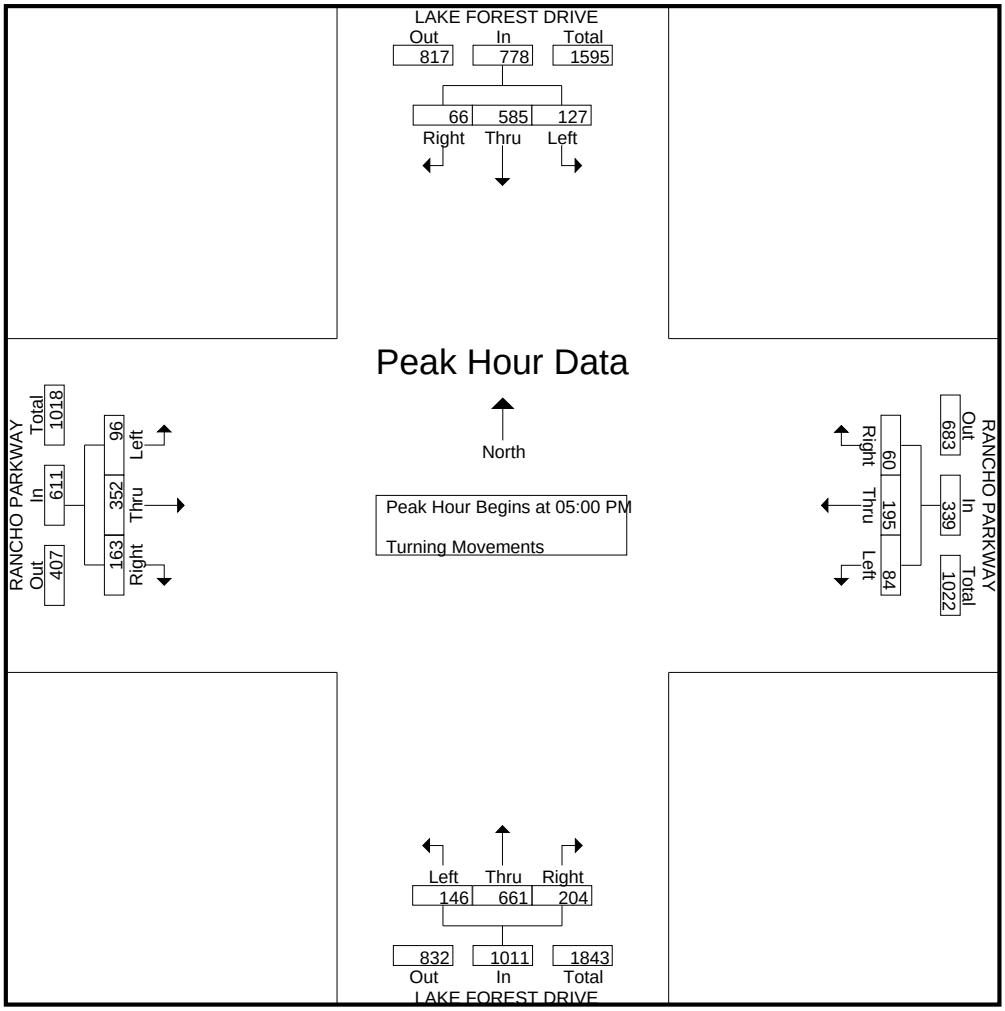


Transportation Studies, Inc.
2640 Walnut Avenue, Suite H
Tustin, CA. 92780

City: LAKE FOREST
N-S Direction: LAKE FOREST DRIVE
E-W Direction: RANCHO PARKWAY-NORTH

File Name : H1305053
Site Code : 516
Start Date : 5/30/2013
Page No : 3

	LAKE FOREST DRIVE Southbound				RANCHO PARKWAY Westbound				LAKE FOREST DRIVE Northbound				RANCHO PARKWAY Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	13	147	25	185	14	42	20	76	38	151	25	214	26	66	9	101	576
05:15 PM	17	**177**	**37**	**231**	11	49	24	84	**70**	**187**	37	**294**	45	**101**	**44**	**190**	**799**
05:30 PM	**20**	121	32	173	**25**	**56**	12	**93**	43	165	**43**	251	37	97	16	150	667
05:45 PM	16	140	33	189	10	48	**28**	86	53	158	41	252	**55**	88	27	170	697
Total Volume	66	585	127	778	60	195	84	339	204	661	146	1011	163	352	96	611	2739
% App. Total	8.5	75.2	16.3		17.7	57.5	24.8		20.2	65.4	14.4		26.7	57.6	15.7		
PHF	.825	.826	.858	.842	.600	.871	.750	.911	.729	.884	.849	.860	.741	.871	.545	.804	.857



INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: PACIFIC TRAFFIC DATA tel: 951 249 3226 pacific@aimtd.com

DATE:				
Tue, Jul 30, 13	LOCATION:	Lake Forest	PROJECT #:	SC0214
	NORTH & SOUTH:	Sports Park	LOCATION #:	1
	EAST & WEST:	Rancho Parkway	CONTROL:	NO SIGNAL

NOTES:

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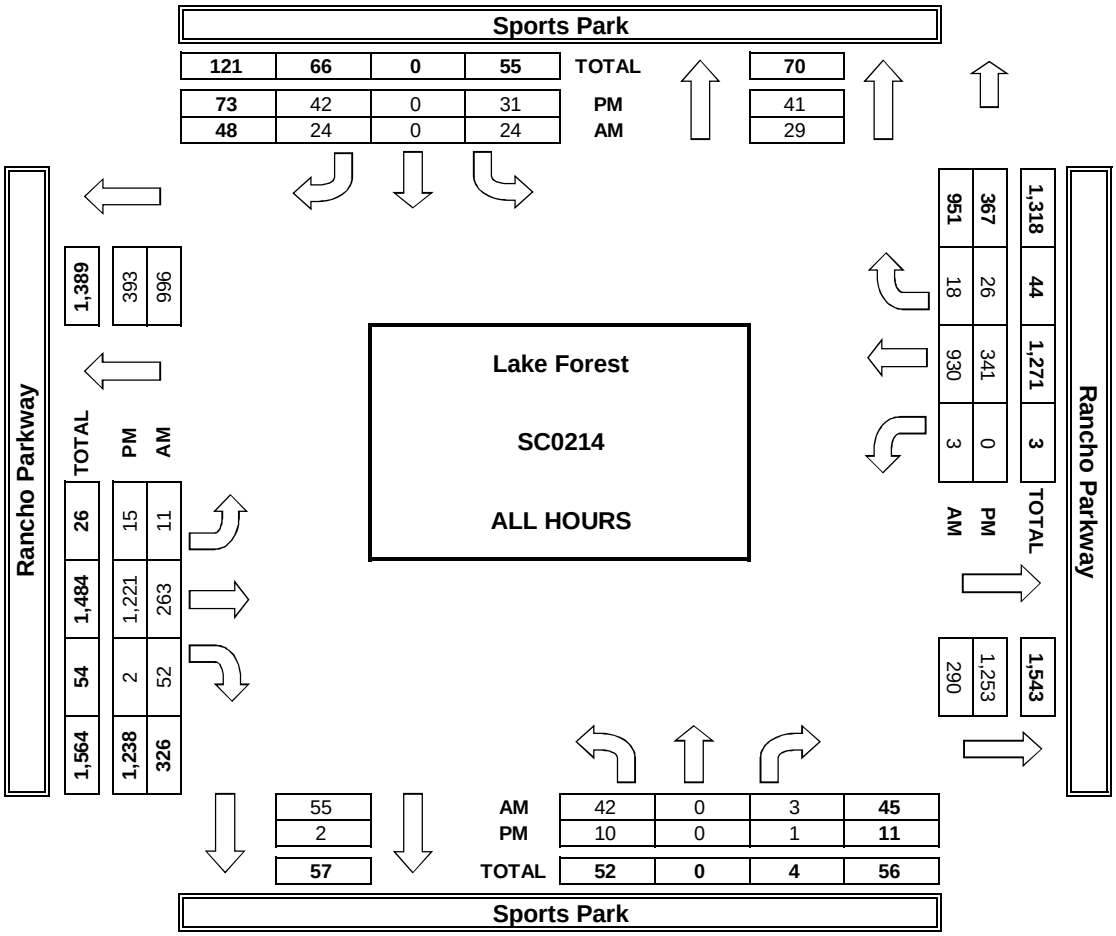
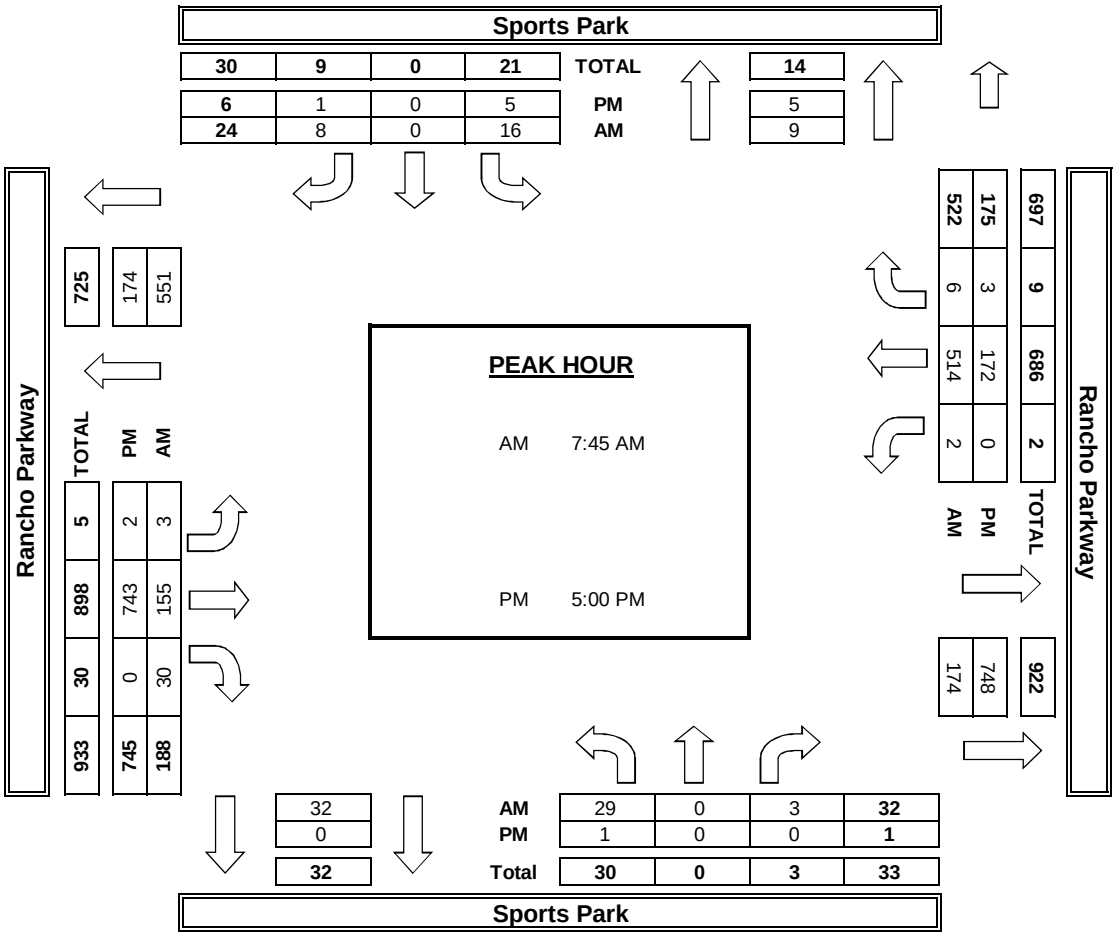
		NORTHBOUND Sports Park			SOUTHBOUND Sports Park			EASTBOUND Rancho Parkway			WESTBOUND Rancho Parkway			
		NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
	LANES:	0	1	0	0	1	0	1	2	0	0	2	0	
AM	7:00 AM	0	0	0	4	0	4	3	22	4	0	90	4	131
	7:15 AM	1	0	0	2	0	6	1	23	4	1	116	4	158
	7:30 AM	6	0	0	1	0	4	3	18	6	0	83	4	125
	7:45 AM	7	0	2	4	0	2	0	41	8	0	164	2	230
	8:00 AM	11	0	1	10	0	3	3	39	10	1	105	1	184
	8:15 AM	3	0	0	1	0	3	0	26	2	1	124	1	161
	8:30 AM	8	0	0	1	0	0	0	49	10	0	121	2	191
	8:45 AM	6	0	0	1	0	2	1	45	8	0	127	0	190
	VOLUMES	42	0	3	24	0	24	11	263	52	3	930	18	1,381
	APPROACH %	93%	0%	7%	50%	0%	50%	3%	81%	16%	0%	98%	2%	
	APP/DEPART	45	/	29	48	/	55	334	/	293	954	/	1,004	0
	BEGIN PEAK HR		7:45 AM											
	VOLUMES	29	0	3	16	0	8	3	155	30	2	514	6	766
	APPROACH %	91%	0%	9%	67%	0%	33%	2%	82%	16%	0%	98%	1%	
	PEAK HR FACTOR		0.667			0.462			0.797			0.786		0.833
	APP/DEPART	32	/	9	24	/	32	188	/	174	522	/	551	0
PM	4:00 PM	7	0	1	3	0	6	8	108	2	0	43	13	191
	4:15 PM	1	0	0	8	0	22	5	105	0	0	49	6	196
	4:30 PM	1	0	0	11	0	11	0	129	0	0	34	2	188
	4:45 PM	0	0	0	4	0	2	0	136	0	0	43	2	187
	5:00 PM	0	0	0	2	0	1	2	217	0	0	39	1	262
	5:15 PM	0	0	0	3	0	0	0	187	0	0	52	0	242
	5:30 PM	1	0	0	0	0	0	0	186	0	0	39	1	227
	5:45 PM	0	0	0	0	0	0	0	153	0	0	42	1	196
	VOLUMES	10	0	1	31	0	42	15	1,221	2	0	341	26	1,695
	APPROACH %	91%	0%	9%	42%	0%	58%	1%	99%	0%	0%	93%	7%	
	APP/DEPART	11	/	41	73	/	2	1,243	/	1,254	368	/	398	0
	BEGIN PEAK HR		5:00 PM											
	VOLUMES	1	0	0	5	0	1	2	743	0	0	172	3	927
	APPROACH %	100%	0%	0%	83%	0%	17%	0%	100%	0%	0%	98%	2%	
	PEAK HR FACTOR		0.250			0.500			0.850			0.841		0.885
	APP/DEPART	1	/	5	6	/	0	745	/	748	175	/	174	0

PACIFIC TRAFFIC DATA SERVICES

TURNING MOVEMENT COUNTS





INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: PACIFIC TRAFFIC DATA tel: 951 249 3226 pacific@aimtd.com

DATE:	LOCATION:	Lake Forest	PROJECT #:	SC0214
Tue, Jul 30, 13	NORTH & SOUTH:	Portola Parkway	LOCATION #:	2
	EAST & WEST:	Rancho Parkway	CONTROL:	SIGNAL

NOTES:

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OTHER

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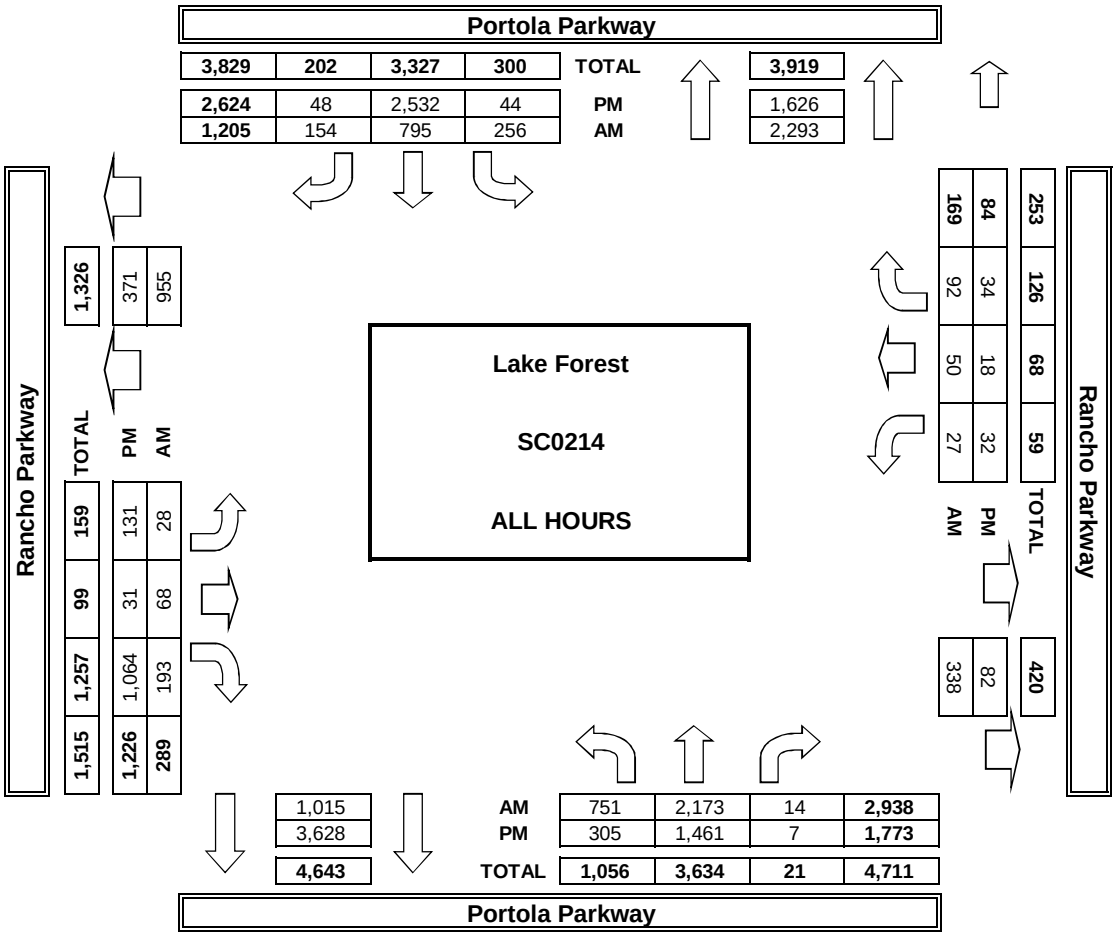
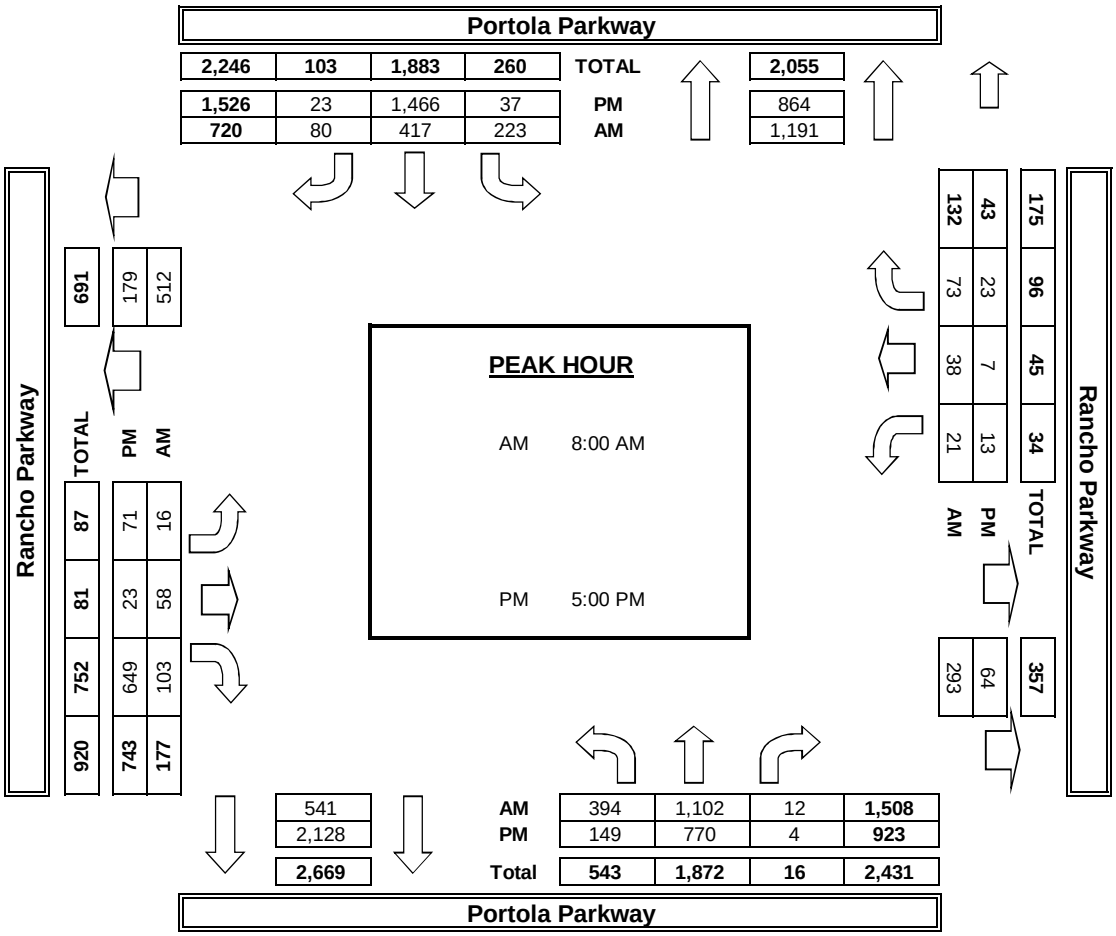
		NORTHBOUND Portola Parkway			SOUTHBOUND Portola Parkway			EASTBOUND Rancho Parkway			WESTBOUND Rancho Parkway			
		NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
	LANES:	1	3	0	2	3	0	1.5	0.5	1	1.3	0.3	2.3	
AM	7:00 AM	80	196	0	4	79	18	5	0	25	0	1	2	410
	7:15 AM	91	298	0	3	101	18	0	2	23	0	3	4	543
	7:30 AM	81	258	0	8	91	6	2	1	15	1	3	5	471
	7:45 AM	105	319	2	18	107	32	5	7	27	5	5	8	640
	8:00 AM	117	313	2	30	99	17	7	13	30	2	10	6	646
	8:15 AM	96	317	3	46	93	20	3	13	18	5	4	11	629
	8:30 AM	94	237	2	57	111	22	2	14	19	3	10	19	590
	8:45 AM	87	235	5	90	114	21	4	18	36	11	14	37	672
	VOLUMES	751	2,173	14	256	795	154	28	68	193	27	50	92	4,602
	APPROACH %	26%	74%	0%	21%	66%	13%	10%	24%	67%	16%	30%	54%	
	APP/DEPART	2,938	/	2,293	1,205	/	1,015	290	/	338	169	/	956	0
	BEGIN PEAK HR		8:00 AM											
	VOLUMES	394	1,102	12	223	417	80	16	58	103	21	38	73	2,537
	APPROACH %	26%	73%	1%	31%	58%	11%	9%	33%	58%	16%	29%	55%	
	PEAK HR FACTOR		0.873			0.800			0.763			0.532		0.944
	APP/DEPART	1,508	/	1,191	720	/	541	177	/	293	132	/	512	0
PM	4:00 PM	38	145	0	1	263	5	13	5	101	6	3	3	583
	4:15 PM	47	156	2	1	260	6	14	2	84	5	1	2	580
	4:30 PM	42	183	0	2	268	9	17	1	123	5	2	2	654
	4:45 PM	29	207	1	3	275	5	16	0	107	3	5	4	655
	5:00 PM	33	168	0	6	304	5	25	7	169	3	3	7	730
	5:15 PM	49	198	2	6	487	5	15	8	170	5	1	4	950
	5:30 PM	40	198	2	11	323	3	23	4	151	1	1	3	760
	5:45 PM	27	206	0	14	352	10	8	4	159	4	2	9	795
	VOLUMES	305	1,461	7	44	2,532	48	131	31	1,064	32	18	34	5,707
	APPROACH %	17%	82%	0%	2%	96%	2%	11%	3%	87%	38%	21%	40%	
	APP/DEPART	1,773	/	1,626	2,624	/	3,628	1,226	/	82	84	/	371	0
	BEGIN PEAK HR		5:00 PM											
	VOLUMES	149	770	4	37	1,466	23	71	23	649	13	7	23	3,235
	APPROACH %	16%	83%	0%	2%	96%	2%	10%	3%	87%	30%	16%	53%	
	PEAK HR FACTOR		0.927			0.766			0.924			0.717		0.851
	APP/DEPART	923	/	864	1,526	/	2,128	743	/	64	43	/	179	0

PACIFIC TRAFFIC DATA SERVICES

TURNING MOVEMENT COUNTS





INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: PACIFIC TRAFFIC DATA tel: 951 249 3226 pacific@aimtd.com

DATE:	LOCATION:	Lake Forest	PROJECT #:	SC0214
Thu, Aug 1, 13	NORTH & SOUTH:	Portola Parkway	LOCATION #:	3
	EAST & WEST:	El Toro Road	CONTROL:	SIGNAL

NOTES:

AM
PM
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OTHER
OTHER

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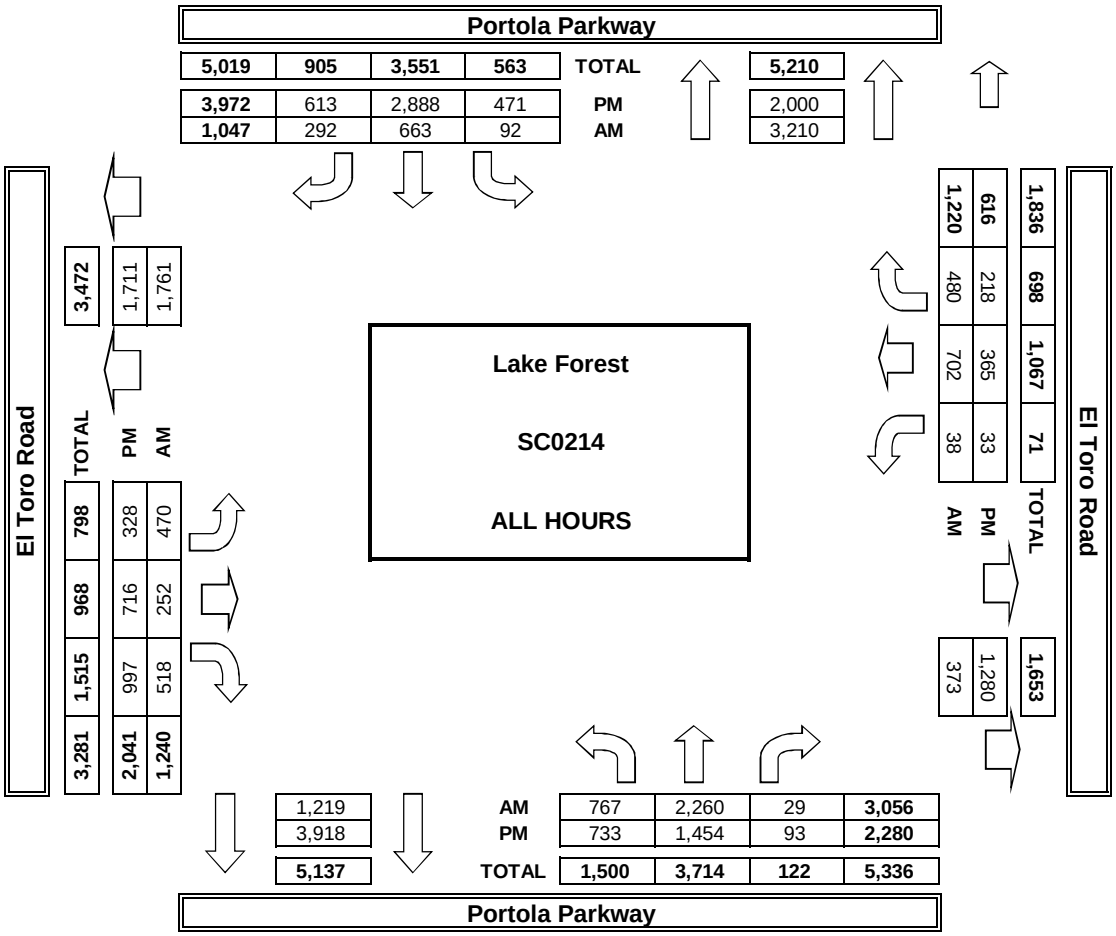
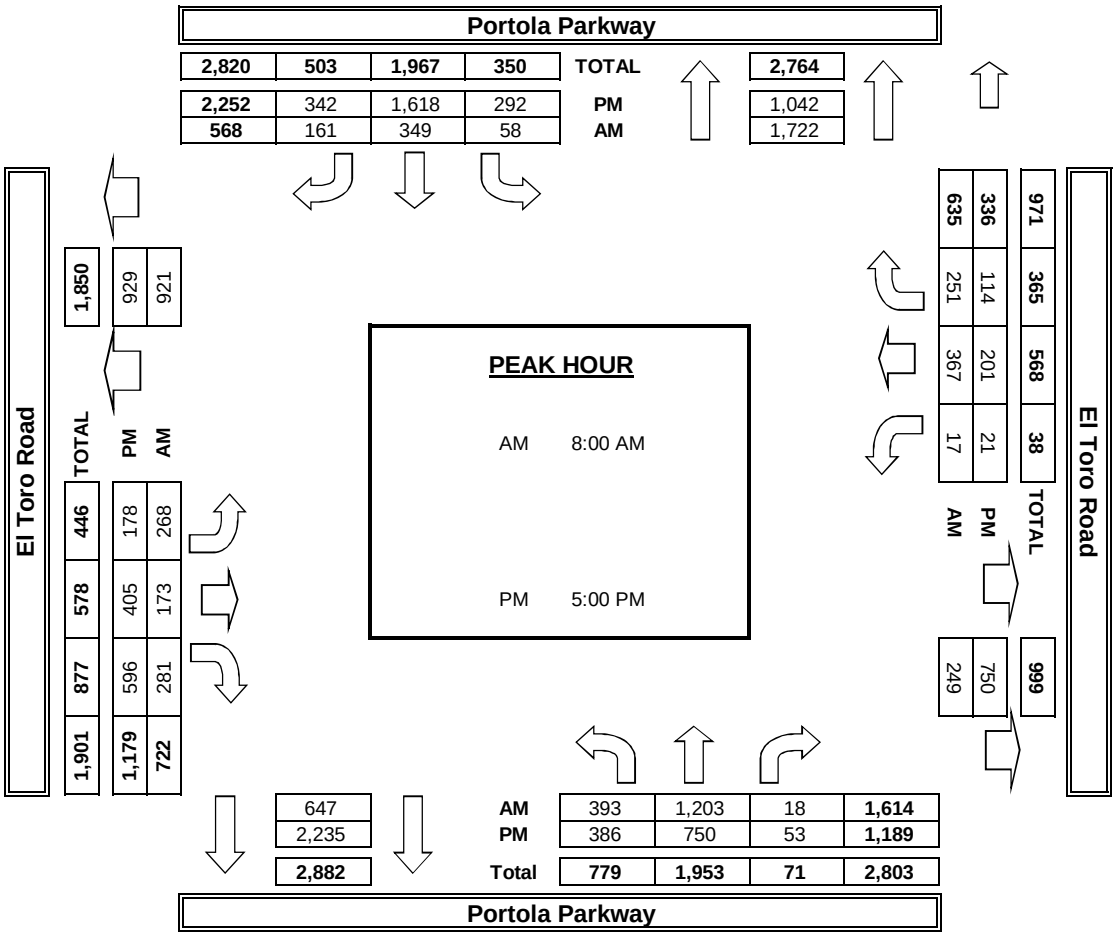
		NORTHBOUND Portola Parkway			SOUTHBOUND Portola Parkway			EASTBOUND El Toro Road			WESTBOUND El Toro Road			
	LANES:	NL 2	NT 4	NR 0	SL 1	ST 3	SR 1	EL 2	ET 2	ER 0	WL 1	WT 3	WR 1	TOTAL
AM	7:00 AM	83	171	2	7	68	25	36	14	33	12	74	42	567
	7:15 AM	110	268	3	9	57	45	43	21	49	3	92	63	763
	7:30 AM	81	256	3	8	100	35	54	25	68	4	86	54	774
	7:45 AM	100	362	3	10	89	26	69	19	87	2	83	70	920
	8:00 AM	111	300	4	9	83	43	66	32	61	4	104	84	901
	8:15 AM	91	374	5	16	78	33	74	30	73	4	77	50	905
	8:30 AM	84	265	3	13	78	37	70	45	69	4	72	58	798
	8:45 AM	107	264	6	20	110	48	58	66	78	5	114	59	935
	VOLUMES	767	2,260	29	92	663	292	470	252	518	38	702	480	6,564
	APPROACH %	25%	74%	1%	9%	63%	28%	38%	20%	42%	3%	58%	39%	
	APP/DEPART	3,056	/	3,210	1,047	/	1,219	1,241	/	373	1,220	/	1,762	0
	BEGIN PEAK HR		8:00 AM											
	VOLUMES	393	1,203	18	58	349	161	268	173	281	17	367	251	3,539
	APPROACH %	24%	75%	1%	10%	61%	28%	37%	24%	39%	3%	58%	40%	
	PEAK HR FACTOR		0.859			0.798			0.894			0.827		0.946
	APP/DEPART	1,614	/	1,722	568	/	647	722	/	249	635	/	921	0
PM	4:00 PM	68	172	11	44	257	80	44	65	87	1	41	27	897
	4:15 PM	92	179	12	42	316	60	39	71	89	2	47	31	980
	4:30 PM	94	164	10	47	354	67	36	83	91	8	42	20	1,016
	4:45 PM	93	189	7	46	343	64	31	92	134	1	34	26	1,060
	5:00 PM	95	168	10	75	396	85	51	84	143	7	46	20	1,180
	5:15 PM	96	189	15	68	455	105	59	120	166	5	53	29	1,360
	5:30 PM	104	211	15	78	384	72	34	122	144	4	44	31	1,243
	5:45 PM	91	182	13	71	383	80	34	79	143	5	58	34	1,173
	VOLUMES	733	1,454	93	471	2,888	613	328	716	997	33	365	218	8,910
	APPROACH %	32%	64%	4%	12%	73%	15%	16%	35%	49%	5%	59%	35%	
	APP/DEPART	2,281	/	2,000	3,972	/	3,919	2,041	/	1,280	616	/	1,711	0
	BEGIN PEAK HR		5:00 PM											
	VOLUMES	386	750	53	292	1,618	342	178	405	596	21	201	114	4,956
	APPROACH %	32%	63%	4%	13%	72%	15%	15%	34%	51%	6%	60%	34%	
	PEAK HR FACTOR		0.901			0.896			0.854			0.866		0.911
	APP/DEPART	1,189	/	1,042	2,252	/	2,235	1,179	/	750	336	/	929	0

PACIFIC TRAFFIC DATA SERVICES

TURNING MOVEMENT COUNTS





APPENDIX C
LOS Analysis Sheets

Existing Conditions

Baker Ranch 30 Acre Residential Project
Existing Conditions
AM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #1 Lake Forest Dr / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.400
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	20	Level Of Service:	A

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1	0	2	0 1	1	0	2	0 1	1	0	1	0 1	1	0	2	0 1
Volume Module:																
Base Vol:	112	546	95	110	494	76	30	100	53	136	273	40				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	112	546	95	110	494	76	30	100	53	136	273	40				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Volume:	112	546	95	110	494	76	30	100	53	136	273	40				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	112	546	95	110	494	76	30	100	53	136	273	40				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75				
FinalVolume:	112	546	71	110	494	57	30	100	40	136	273	30				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	2.00	1.00				
Final Sat.:	1700	3400	1700	1700	3400	1700	1700	1700	1700	1700	3400	1700				
Capacity Analysis Module:																
Vol/Sat:	0.07	0.16	0.04	0.06	0.15	0.03	0.02	0.06	0.02	0.08	0.08	0.02				
Crit Moves:	****				****			****		****						

Baker Ranch 30 Acre Residential Project
Existing Conditions
AM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #2 Portola Pkwy / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.387
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	20	Level Of Service:	A

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Protected				Protected				Split Phase				Split Phase			
Rights:	Include				Ovl				Ignore				Ovl			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2	0	3	0 1	2	0	3	0 1	1	1	0	0 1	1	1	0	1 1
Volume Module:																
Base Vol:	394	1102	12	223	417	80	16	58	103	21	38	73				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	394	1102	12	223	417	80	16	58	103	21	38	73				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Volume:	394	1102	12	223	417	80	16	58	0	21	38	73				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	394	1102	12	223	417	80	16	58	0	21	38	73				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.00	1.00	1.00	0.75				
FinalVolume:	394	1102	9	223	417	60	16	58	0	21	38	55				
OvlAdjVol:						2						0				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	2.00	3.00	1.00	2.00	3.00	1.00	1.00	1.00	1.00	1.00	1.07	1.93				
Final Sat.:	3400	5100	1700	3400	5100	1700	1700	1700	1700	1700	1814	3286				
Capacity Analysis Module:																
Vol/Sat:	0.12	0.22	0.01	0.07	0.08	0.04	0.01	0.03	0.00	0.01	0.02	0.02				
OvlAdjV/S:						0.00						0.00				
Crit Moves:	****			****				****			****					

Baker Ranch 30 Acre Residential Project
Existing Conditions
AM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #3 Portola Pwy / El Toro Rd

Cycle (sec):	100	Critical Vol./Cap.(X):	0.512
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	24	Level Of Service:	A

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Ignore				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2	0	4	0 1	2	0	3	0 1	1	0	3	0 1	1	0	3	0 1
Volume Module:																
Base Vol:	393	1203	18	58	349	161	268	173	281	17	367	251				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	393	1203	18	58	349	161	268	173	281	17	367	251				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Volume:	393	1203	18	58	349	161	268	173	0	17	367	251				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	393	1203	18	58	349	161	268	173	0	17	367	251				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.00	1.00	1.00	0.75				
FinalVolume:	393	1203	14	58	349	121	268	173	0	17	367	188				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	2.00	4.00	1.00	2.00	3.00	1.00	1.00	3.00	1.00	1.00	3.00	1.00				
Final Sat.:	3400	6800	1700	3400	5100	1700	1700	5100	1700	1700	5100	1700				
Capacity Analysis Module:																
Vol/Sat:	0.12	0.18	0.01	0.02	0.07	0.07	0.16	0.03	0.00	0.01	0.07	0.11				
Crit Moves:		****		****			****					****				

Baker Ranch 30 Acre Residential Project
Existing Conditions
AM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Base Volume Alternative)

Intersection #4 Sports Park / Rancho Pkwy

Average Delay (sec/veh): 1.0 Worst Case Level Of Service: B[13.3]

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Stop Sign				Stop Sign				Uncontrolled				Uncontrolled			
Rights:	Include				Include				Include				Include			
Lanes:	0	0	1!	0 0	0	0	1!	0 0	1	0	1	1 0	1	0	1	1 0
Volume Module:																
Base Vol:	29	0	3	16	0	8	3	155	30	2	514	6				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	29	0	3	16	0	8	3	155	30	2	514	6				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Volume:	29	0	3	16	0	8	3	155	30	2	514	6				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
FinalVolume:	29	0	3	16	0	8	3	155	30	2	514	6				
Critical Gap Module:																
Critical Gp:	7.5	6.5	6.9	7.5	6.5	6.9	4.1	xxxx	xxxxx	4.1	xxxx	xxxxx				
FollowUpTim:	3.5	4.0	3.3	3.5	4.0	3.3	2.2	xxxx	xxxxx	2.2	xxxx	xxxxx				
Capacity Module:																
Cnflict Vol:	437	700	93	605	712	260	520	xxxx	xxxxx	185	xxxx	xxxxx				
Potent Cap.:	508	366	953	386	360	745	1056	xxxx	xxxxx	1402	xxxx	xxxxx				
Move Cap.:	501	364	953	384	359	745	1056	xxxx	xxxxx	1402	xxxx	xxxxx				
Volume/Cap:	0.06	0.00	0.00	0.04	0.00	0.01	0.00	xxxx	xxxx	0.00	xxxx	xxxx				
Level Of Service Module:																
2Way95thQ:	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	0.0	xxxx	xxxxx	0.0	xxxx	xxxxx				
Control Del:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	8.4	xxxx	xxxxx	7.6	xxxx	xxxxx				
LOS by Move:	*	*	*	*	*	*	A	*	*	A	*	*				
Movement:	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT				
Shared Cap.:	xxxx	524	xxxxx	xxxx	458	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx				
SharedQueue:	xxxxx	0.2	xxxxx	xxxxx	0.2	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx				
Shrd ConDel:	xxxxx	12.3	xxxxx	xxxxx	13.3	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx				
Shared LOS:	*	B	*	*	B	*	*	*	*	*	*	*				
ApproachDel:	12.3			13.3			xxxxxx			xxxxxx						
ApproachLOS:	B			B			*			*						

Note: Queue reported is the number of cars per lane.

Baker Ranch 30 Acre Residential Project
Existing Conditions
PM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #1 Lake Forest Dr / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.564
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	27	Level Of Service:	A

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1	0	2	0 1	1	0	2	0 1	1	0	1	0 1	1	0	2	0 1
Volume Module:																
Base Vol:	146	661	204	127	585	66	96	352	163	84	195	60				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	146	661	204	127	585	66	96	352	163	84	195	60				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Volume:	146	661	204	127	585	66	96	352	163	84	195	60				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	146	661	204	127	585	66	96	352	163	84	195	60				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75				
FinalVolume:	146	661	153	127	585	50	96	352	122	84	195	45				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	2.00	1.00				
Final Sat.:	1700	3400	1700	1700	3400	1700	1700	1700	1700	1700	3400	1700				
Capacity Analysis Module:																
Vol/Sat:	0.09	0.19	0.09	0.07	0.17	0.03	0.06	0.21	0.07	0.05	0.06	0.03				
Crit Moves:	****				****			****		****						

Baker Ranch 30 Acre Residential Project
Existing Conditions
PM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #2 Portola Pkwy / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.414
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	20	Level Of Service:	A

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Protected				Protected				Split Phase				Split Phase			
Rights:	Include				Ovl				Ignore				Ovl			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2	0	3	0 1	2	0	3	0 1	1	1	0	0 1	1	1	0	1 1
Volume Module:																
Base Vol:	149	770	4	37	1466	23	71	23	649	13	7	23				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	149	770	4	37	1466	23	71	23	649	13	7	23				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Volume:	149	770	4	37	1466	23	71	23	0	13	7	23				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	149	770	4	37	1466	23	71	23	0	13	7	23				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.00	1.00	1.00	0.75				
FinalVolume:	149	770	3	37	1466	17	71	23	0	13	7	17				
OvlAdjVol:						0						0				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	2.00	3.00	1.00	2.00	3.00	1.00	1.51	0.49	1.00	1.40	0.75	1.85				
Final Sat.:	3400	5100	1700	3400	5100	1700	2568	832	1700	2376	1279	3145				
Capacity Analysis Module:																
Vol/Sat:	0.04	0.15	0.00	0.01	0.29	0.01	0.03	0.03	0.00	0.01	0.01	0.01				
OvlAdjV/S:						0.00						0.00				
Crit Moves:	****				****			****		****						

Baker Ranch 30 Acre Residential Project
Existing Conditions
PM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #3 Portola Pwy / El Toro Rd

Cycle (sec):	100	Critical Vol./Cap.(X):	0.636
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	31	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Ignore				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2	0	4	0 1	2	0	3	0 1	1	0	3	0 1	1	0	3	0 1
Volume Module:																
Base Vol:	386	750	53		292	1618	342		178	405	596		21	201	114	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	386	750	53		292	1618	342		178	405	596		21	201	114	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	0.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	0.00		1.00	1.00	1.00	
PHF Volume:	386	750	53		292	1618	342		178	405	0		21	201	114	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	386	750	53		292	1618	342		178	405	0		21	201	114	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	0.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	0.75		1.00	1.00	0.75		1.00	1.00	0.00		1.00	1.00	0.75	
FinalVolume:	386	750	40		292	1618	257		178	405	0		21	201	86	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	2.00	4.00	1.00		2.00	3.00	1.00		1.00	3.00	1.00		1.00	3.00	1.00	
Final Sat.:	3400	6800	1700		3400	5100	1700		1700	5100	1700		1700	5100	1700	
Capacity Analysis Module:																
Vol/Sat:	0.11	0.11	0.02		0.09	0.32	0.15		0.10	0.08	0.00		0.01	0.04	0.05	
Crit Moves:	****					****			****						****	

Baker Ranch 30 Acre Residential Project
Existing Conditions
PM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Base Volume Alternative)

Intersection #4 Sports Park / Rancho Pkwy

Average Delay (sec/veh): 0.1 Worst Case Level Of Service: C[18.7]

Approach:	North Bound					South Bound					East Bound					West Bound				
Movement:	L	-	T	-	R	L	-	T	-	R	L	-	T	-	R	L	-	T	-	R
Control:	Stop Sign					Stop Sign					Uncontrolled					Uncontrolled				
Rights:	Include					Include					Include					Include				
Lanes:	1	0	0	0	0	0	0	1!	0	0	1	0	1	1	0	1	0	1	1	0
Volume Module:																				
Base Vol:	1	0	0		5	0	1		2	743	0		0	172	3					
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00					
Initial Bse:	1	0	0		5	0	1		2	743	0		0	172	3					
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00					
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00					
PHF Volume:	1	0	0		5	0	1		2	743	0		0	172	3					
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0					
FinalVolume:	1	0	0		5	0	1		2	743	0		0	172	3					
Critical Gap Module:																				
Critical Gp:	7.5	xxxx	xxxxx		7.5	6.5	6.9		4.1	xxxx	xxxxx		xxxxx	xxxx	xxxxx					
FollowUpTim:	3.5	xxxx	xxxxx		3.5	4.0	3.3		2.2	xxxx	xxxxx		xxxxx	xxxx	xxxxx					
Capacity Module:																				
Cnflict Vol:	833	xxxx	xxxxx		549	921	88		175	xxxx	xxxxx		xxxx	xxxx	xxxxx					
Potent Cap.:	265	xxxx	xxxxx		423	273	960		1414	xxxx	xxxxx		xxxx	xxxx	xxxxx					
Move Cap.:	264	xxxx	xxxxx		422	272	960		1414	xxxx	xxxxx		xxxx	xxxx	xxxxx					
Volume/Cap:	0.00	xxxx	xxxx		0.01	0.00	0.00		0.00	xxxx	xxxx		xxxx	xxxx	xxxx					
Level Of Service Module:																				
2Way95thQ:	0.0	xxxx	xxxxx		xxxx	xxxx	xxxxx		0.0	xxxx	xxxxx		xxxx	xxxx	xxxxx					
Control Del:	18.7	xxxx	xxxxx		xxxxx	xxxx	xxxxx		7.6	xxxx	xxxxx		xxxxx	xxxx	xxxxx					
LOS by Move:	C	*	*		*	*	*		A	*	*		*	*	*					
Movement:	LT - LTR - RT					LT - LTR - RT					LT - LTR - RT					LT - LTR - RT				
Shared Cap.:	xxxx	xxxx	xxxxx		xxxx	466	xxxxx		xxxx	xxxx	xxxxx		xxxx	xxxx	xxxxx					
SharedQueue:	xxxxx	xxxx	xxxxx		xxxxx	0.0	xxxxx		xxxxx	xxxx	xxxxx		xxxxx	xxxx	xxxxx					
Shrd ConDel:	xxxxx	xxxx	xxxxx		xxxxx	12.8	xxxxx		xxxxx	xxxx	xxxxx		xxxxx	xxxx	xxxxx					
Shared LOS:	*	*	*		*	B	*		*	*	*		*	*	*					
ApproachDel:	18.7					12.8			xxxxxx				xxxxxx							
ApproachLOS:	C					B			*				*							

Note: Queue reported is the number of cars per lane.

Forecast Existing Plus Project Conditions

Baker Ranch 30 Acre Residential Project
Forecast Existing Plus Project Conditions
AM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #1 Lake Forest Dr / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.438
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	21	Level Of Service:	A

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	-	R	L	- T	-	R	L	- T	-	R	L	- T	-	R
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1	0 2	0	1	1	0 2	0	1	1	0 1	0	1	1	0 2	0	1
Volume Module:																
Base Vol:	112	546	95		110	494	76		30	100	53		136	273	40	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	112	546	95		110	494	76		30	100	53		136	273	40	
Added Vol:	0	0	9		6	0	0		0	2	0		32	5	22	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	112	546	104		116	494	76		30	102	53		168	278	62	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	112	546	104		116	494	76		30	102	53		168	278	62	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	112	546	104		116	494	76		30	102	53		168	278	62	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	0.75		1.00	1.00	0.75		1.00	1.00	0.75		1.00	1.00	0.75	
FinalVolume:	112	546	78		116	494	57		30	102	40		168	278	47	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	2.00	1.00		1.00	2.00	1.00		1.00	1.00	1.00		1.00	2.00	1.00	
Final Sat.:	1700	3400	1700		1700	3400	1700		1700	1700	1700		1700	3400	1700	
Capacity Analysis Module:																
Vol/Sat:	0.07	0.16	0.05		0.07	0.15	0.03		0.02	0.06	0.02		0.10	0.08	0.03	
Crit Moves:		****			****					****			****			

Baker Ranch 30 Acre Residential Project
Forecast Existing Plus Project Conditions
AM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #2 Portola Pkwy / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.387
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	20	Level Of Service:	A

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	-	R	L	- T	-	R	L	- T	-	R	L	- T	-	R
Control:	Protected				Protected				Split Phase				Split Phase			
Rights:	Include				Ovl				Ignore				Ovl			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2	0 3	0	1	2	0 3	0	1	1	1 0	0	1	1	1 0	1	1
Volume Module:																
Base Vol:	394	1102	12		223	417	80		16	58	103		21	38	73	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	394	1102	12		223	417	80		16	58	103		21	38	73	
Added Vol:	9	0	0		0	0	5		16	0	32		0	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	403	1102	12		223	417	85		32	58	135		21	38	73	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	0.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	0.00		1.00	1.00	1.00	
PHF Volume:	403	1102	12		223	417	85		32	58	0		21	38	73	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	403	1102	12		223	417	85		32	58	0		21	38	73	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	0.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	0.75		1.00	1.00	0.75		1.00	1.00	0.00		1.00	1.00	0.75	
FinalVolume:	403	1102	9		223	417	64		32	58	0		21	38	55	
OvlAdjVol:							6								0	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	2.00	3.00	1.00		2.00	3.00	1.00		1.00	1.00	1.00		1.00	1.07	1.93	
Final Sat.:	3400	5100	1700		3400	5100	1700		1700	1700	1700		1700	1814	3286	
Capacity Analysis Module:																
Vol/Sat:	0.12	0.22	0.01		0.07	0.08	0.04		0.02	0.03	0.00		0.01	0.02	0.02	
OvlAdjV/S:							0.00								0.00	
Crit Moves:		****			****					****				****		

Baker Ranch 30 Acre Residential Project
Forecast Existing Plus Project Conditions
AM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #3 Portola Pwy / El Toro Rd

Cycle (sec):	100	Critical Vol./Cap.(X):	0.515
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	24	Level Of Service:	A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L -	T -	R	L -	T -	R	L -	T -	R	L -	T -	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Ignore			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2 0	4 0	1	2 0	3 0	1	1 0	3 0	1	1 0	3 0	1
Volume Module:												
Base Vol:	393	1203	18	58	349	161	268	173	281	17	367	251
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	393	1203	18	58	349	161	268	173	281	17	367	251
Added Vol:	0	5	0	0	16	16	5	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	393	1208	18	58	365	177	273	173	281	17	367	251
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00
PHF Volume:	393	1208	18	58	365	177	273	173	0	17	367	251
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	393	1208	18	58	365	177	273	173	0	17	367	251
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.00	1.00	1.00	0.75
FinalVolume:	393	1208	14	58	365	133	273	173	0	17	367	188
Saturation Flow Module:												
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	2.00	4.00	1.00	2.00	3.00	1.00	1.00	3.00	1.00	1.00	3.00	1.00
Final Sat.:	3400	6800	1700	3400	5100	1700	1700	5100	1700	1700	5100	1700
Capacity Analysis Module:												
Vol/Sat:	0.12	0.18	0.01	0.02	0.07	0.08	0.16	0.03	0.00	0.01	0.07	0.11
Crit Moves:	****					****	****					****

Baker Ranch 30 Acre Residential Project
Forecast Existing Plus Project Conditions
AM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #4 Sports Park / Rancho Pkwy

Average Delay (sec/veh): 3.1 Worst Case Level Of Service: C[15.3]

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L -	T -	R	L -	T -	R	L -	T -	R	L -	T -	R
Control:	Stop Sign			Stop Sign			Uncontrolled			Uncontrolled		
Rights:	Include			Include			Include			Include		
Lanes:	0 0	1! 0	0	0 0	1! 0	0	1 0	1 1	0	1 0	1 1	0
Volume Module:												
Base Vol:	29	0	3	0	0	0	0	155	30	2	514	0
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	29	0	3	0	0	0	0	155	30	2	514	0
Added Vol:	0	0	0	63	0	77	26	0	0	0	0	22
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	29	0	3	63	0	77	26	155	30	2	514	22
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	29	0	3	63	0	77	26	155	30	2	514	22
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
FinalVolume:	29	0	3	63	0	77	26	155	30	2	514	22
Critical Gap Module:												
Critical Gp:	7.5	6.5	6.9	7.5	6.5	6.9	4.1	xxxx	xxxxx	4.1	xxxx	xxxxx
FollowUpTim:	3.5	4.0	3.3	3.5	4.0	3.3	2.2	xxxx	xxxxx	2.2	xxxx	xxxxx
Capacity Module:												
Cnflict Vol:	483	762	93	659	766	268	536	xxxx	xxxxx	185	xxxx	xxxxx
Potent Cap.:	471	337	953	353	335	736	1042	xxxx	xxxxx	1402	xxxx	xxxxx
Move Cap.:	413	328	953	345	326	736	1042	xxxx	xxxxx	1402	xxxx	xxxxx
Volume/Cap:	0.07	0.00	0.00	0.18	0.00	0.10	0.02	xxxx	xxxx	0.00	xxxx	xxxx
Level Of Service Module:												
2Way95thQ:	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	0.1	xxxx	xxxxx	0.0	xxxx	xxxxx
Control Del:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	8.5	xxxx	xxxxx	7.6	xxxx	xxxxx
LOS by Move:	*	*	*	*	*	*	A	*	*	A	*	*
Movement:	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT
Shared Cap.:	xxxx	437	xxxxx	xxxx	487	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx
SharedQueue:	xxxxx	0.2	xxxxx	xxxxx	1.2	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shrd ConDel:	xxxxx	13.9	xxxxx	xxxxx	15.3	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shared LOS:	*	B	*	*	C	*	*	*	*	*	*	*
ApproachDel:	13.9			15.3			xxxxxx			xxxxxx		
ApproachLOS:	B			C			*			*		

Note: Queue reported is the number of cars per lane.

Baker Ranch 30 Acre Residential Project
Forecast Existing Plus Project Conditions
PM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #1 Lake Forest Dr / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.598
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	29	Level Of Service:	A

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	-	R	L	- T	-	R	L	- T	-	R	L	- T	-	R
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1	0 2	0	1	1	0 2	0	1	1	0 1	0	1	1	0 2	0	1
Volume Module:																
Base Vol:	146	661	204	127	585	66	96	352	163	84	195	60				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	146	661	204	127	585	66	96	352	163	84	195	60				
Added Vol:	0	0	37	24	0	0	0	6	0	8	1	5				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	146	661	241	151	585	66	96	358	163	92	196	65				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Volume:	146	661	241	151	585	66	96	358	163	92	196	65				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	146	661	241	151	585	66	96	358	163	92	196	65				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75				
FinalVolume:	146	661	181	151	585	50	96	358	122	92	196	49				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	2.00	1.00				
Final Sat.:	1700	3400	1700	1700	3400	1700	1700	1700	1700	1700	3400	1700				
Capacity Analysis Module:																
Vol/Sat:	0.09	0.19	0.11	0.09	0.17	0.03	0.06	0.21	0.07	0.05	0.06	0.03				
Crit Moves:		****		****				****		****						

Baker Ranch 30 Acre Residential Project
Forecast Existing Plus Project Conditions
PM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #2 Portola Pkwy / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.426
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	21	Level Of Service:	A

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	-	R	L	- T	-	R	L	- T	-	R	L	- T	-	R
Control:	Protected				Protected				Split Phase				Split Phase			
Rights:	Include				Ovl				Ignore				Ovl			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2	0 3	0	1	2	0 3	0	1	1	1 0	0	1	1	1 0	1	1
Volume Module:																
Base Vol:	149	770	4	37	1466	23	71	23	649	13	7	23				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	149	770	4	37	1466	23	71	23	649	13	7	23				
Added Vol:	37	0	0	0	0	18	4	0	8	0	0	0				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	186	770	4	37	1466	41	75	23	657	13	7	23				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Volume:	186	770	4	37	1466	41	75	23	0	13	7	23				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	186	770	4	37	1466	41	75	23	0	13	7	23				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.00	1.00	1.00	0.75				
FinalVolume:	186	770	3	37	1466	31	75	23	0	13	7	17				
OvlAdjVol:						0						0				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	2.00	3.00	1.00	2.00	3.00	1.00	1.53	0.47	1.00	1.40	0.75	1.85				
Final Sat.:	3400	5100	1700	3400	5100	1700	2602	798	1700	2376	1279	3145				
Capacity Analysis Module:																
Vol/Sat:	0.05	0.15	0.00	0.01	0.29	0.02	0.03	0.03	0.00	0.01	0.01	0.01				
OvlAdjV/S:						0.00						0.00				
Crit Moves:	****				****			****			****					

Baker Ranch 30 Acre Residential Project
Forecast Existing Plus Project Conditions
PM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #3 Portola Pwy / El Toro Rd

Cycle (sec):	100	Critical Vol./Cap.(X):	0.647
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	32	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Ignore				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2	0	4	0 1	2	0	3	0 1	1	0	3	0 1	1	0	3	0 1
Volume Module:																
Base Vol:	386	750		53	292	1618		342	178	405		596	21	201		114
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	386	750		53	292	1618		342	178	405		596	21	201		114
Added Vol:	0	18		0	0	4		4	18	0		0	0	0		0
PasserByVol:	0	0		0	0	0		0	0	0		0	0	0		0
Initial Fut:	386	768		53	292	1622		346	196	405		596	21	201		114
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	386	768		53	292	1622		346	196	405		0	21	201		114
Reduct Vol:	0	0		0	0	0		0	0	0		0	0	0		0
Reduced Vol:	386	768		53	292	1622		346	196	405		0	21	201		114
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.00	1.00	1.00	0.75				
FinalVolume:	386	768		40	292	1622		260	196	405		0	21	201		86
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	2.00	4.00	1.00	2.00	3.00	1.00	1.00	3.00	1.00	1.00	3.00	1.00				
Final Sat.:	3400	6800	1700	3400	5100	1700	1700	5100	1700	1700	5100	1700				
Capacity Analysis Module:																
Vol/Sat:	0.11	0.11	0.02	0.09	0.32	0.15	0.12	0.08	0.00	0.01	0.04	0.05				
Crit Moves:	****				****		****					****				

Baker Ranch 30 Acre Residential Project
Forecast Existing Plus Project Conditions
PM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #4 Sports Park / Rancho Pkwy

Average Delay (sec/veh): 1.8 Worst Case Level Of Service: D[25.3]

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Stop Sign				Stop Sign				Uncontrolled				Uncontrolled			
Rights:	Include				Include				Include				Include			
Lanes:	1	0	0	0 0	0	0	1!	0 0	1	0	1	1 0	1	0	1	1 0
Volume Module:																
Base Vol:	1	0		0	0	0		0	0	743		0	0	172		0
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	1	0		0	0	0		0	0	743		0	0	172		0
Added Vol:	0	0		0	42	0		51	87	0		0	0	0		71
PasserByVol:	0	0		0	0	0		0	0	0		0	0	0		0
Initial Fut:	1	0		0	42	0		51	87	743		0	0	172		71
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	1	0		0	42	0		51	87	743		0	0	172		71
Reduct Vol:	0	0		0	0	0		0	0	0		0	0	0		0
FinalVolume:	1	0		0	42	0		51	87	743		0	0	172		71
Critical Gap Module:																
Critical Gp:	7.5	xxxx	xxxxx		7.5	6.5		6.9	4.1	xxxx	xxxxx	xxxxx	xxxx	xxxxx		
FollowUpTim:	3.5	xxxx	xxxxx		3.5	4.0		3.3	2.2	xxxx	xxxxx	xxxxx	xxxx	xxxxx		
Capacity Module:																
Cnflict Vol:	1003	xxxx	xxxxx		753	1125		122	243	xxxx	xxxxx	xxxx	xxxx	xxxxx		
Potent Cap.:	199	xxxx	xxxxx		302	207		913	1335	xxxx	xxxxx	xxxx	xxxx	xxxxx		
Move Cap.:	179	xxxx	xxxxx		287	193		913	1335	xxxx	xxxxx	xxxx	xxxx	xxxxx		
Volume/Cap:	0.01	xxxx	xxxx		0.15	0.00		0.06	0.07	xxxx	xxxx	xxxx	xxxx	xxxx		
Level Of Service Module:																
2Way95thQ:	0.0	xxxx	xxxxx		xxxx	xxxx	xxxxx		0.2	xxxx	xxxxx	xxxx	xxxx	xxxxx		
Control Del:	25.3	xxxx	xxxxx		xxxxx	xxxx	xxxxx		7.9	xxxx	xxxxx	xxxxx	xxxx	xxxxx		
LOS by Move:	D	*		*	*	*		*	A	*		*	*	*		
Movement:	LT - LTR - RT				LT - LTR - RT				LT - LTR - RT				LT - LTR - RT			
Shared Cap.:	xxxx	xxxx	xxxxx		xxxx	460	xxxxx		xxxx	xxxx	xxxxx		xxxx	xxxx	xxxxx	
SharedQueue:	xxxxx	xxxx	xxxxx		xxxxx	0.7	xxxxx		xxxxx	xxxx	xxxxx		xxxxx	xxxx	xxxxx	
Shrd ConDel:	xxxxx	xxxx	xxxxx		xxxxx	14.8	xxxxx		xxxxx	xxxx	xxxxx		xxxxx	xxxx	xxxxx	
Shared LOS:	*	*		*	*	B		*	*	*		*	*	*		*
ApproachDel:	25.3				14.8				xxxxxx				xxxxxx			
ApproachLOS:	D				B				*				*			

Note: Queue reported is the number of cars per lane.

Forecast Year 2015 Without Project Conditions

Baker Ranch 30 Acre Residential Project
Forecast Opening Year Without Project Conditions
AM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #1 Lake Forest Dr / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.609
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	29	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1	0	2	0 1	1	0	2	0 1	1	0	1	0 1	1	0	2	0 1
Volume Module:																
Base Vol:	116	696	286	144	829	41	19	171	60	249	560	42				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	116	696	286	144	829	41	19	171	60	249	560	42				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Volume:	116	696	286	144	829	41	19	171	60	249	560	42				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	116	696	286	144	829	41	19	171	60	249	560	42				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75				
FinalVolume:	116	696	215	144	829	31	19	171	45	249	560	32				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	2.00	1.00				
Final Sat.:	1700	3400	1700	1700	3400	1700	1700	1700	1700	1700	3400	1700				
Capacity Analysis Module:																
Vol/Sat:	0.07	0.20	0.13	0.08	0.24	0.02	0.01	0.10	0.03	0.15	0.16	0.02				
Crit Moves:	****				****			****		****						

Baker Ranch 30 Acre Residential Project
Forecast Opening Year Without Project Conditions
AM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #2 Portola Pkwy / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.524
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	25	Level Of Service:	A

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Protected				Protected				Split Phase				Split Phase			
Rights:	Include				Ovl				Ignore				Ovl			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2	0	3	0 1	2	0	3	0 1	1	1	0	0 1	1	1	0	1 1
Volume Module:																
Base Vol:	872	1291	12	223	830	108	49	58	280	21	38	73				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	872	1291	12	223	830	108	49	58	280	21	38	73				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Volume:	872	1291	12	223	830	108	49	58	0	21	38	73				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	872	1291	12	223	830	108	49	58	0	21	38	73				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.00	1.00	1.00	0.75				
FinalVolume:	872	1291	9	223	830	81	49	58	0	21	38	55				
OvlAdjVol:						23						0				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	2.00	3.00	1.00	2.00	3.00	1.00	1.00	1.00	1.00	1.00	1.07	1.93				
Final Sat.:	3400	5100	1700	3400	5100	1700	1700	1700	1700	1700	1814	3286				
Capacity Analysis Module:																
Vol/Sat:	0.26	0.25	0.01	0.07	0.16	0.05	0.03	0.03	0.00	0.01	0.02	0.02				
OvlAdjV/S:						0.01						0.00				
Crit Moves:	****				****			****		****						

Baker Ranch 30 Acre Residential Project
Forecast Opening Year Without Project Conditions
AM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #3 Portola Pwy / El Toro Rd

Cycle (sec):	100	Critical Vol./Cap.(X):	0.659
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	33	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Ignore				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2	0	4	0 1	2	0	3	0 1	1	0	3	0 1	1	0	3	0 1
Volume Module:																
Base Vol:	498	1611	18		50	668	355		328	172	305		49	498	255	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	498	1611	18		50	668	355		328	172	305		49	498	255	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	0.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	0.00		1.00	1.00	1.00	
PHF Volume:	498	1611	18		50	668	355		328	172	0		49	498	255	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	498	1611	18		50	668	355		328	172	0		49	498	255	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	0.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	0.75		1.00	1.00	0.75		1.00	1.00	0.00		1.00	1.00	0.75	
FinalVolume:	498	1611	14		50	668	266		328	172	0		49	498	191	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	2.00	4.00	1.00		2.00	3.00	1.00		1.00	3.00	1.00		1.00	3.00	1.00	
Final Sat.:	3400	6800	1700		3400	5100	1700		1700	5100	1700		1700	5100	1700	
Capacity Analysis Module:																
Vol/Sat:	0.15	0.24	0.01		0.01	0.13	0.16		0.19	0.03	0.00		0.03	0.10	0.11	
Crit Moves:	****						****		****						****	

Baker Ranch 30 Acre Residential Project
Forecast Opening Year Without Project Conditions
AM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #4 Sports Park / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.369
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	19	Level Of Service:	A

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Permitted				Permitted				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	0	0	1!	0 0	0	0	1!	0 0	1	0	1	1 0	1	0	1	1 0
Volume Module:																
Base Vol:	0	0	0		17	0	15		7	370	0		0	1007	11	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	0	0	0		17	0	15		7	370	0		0	1007	11	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	0	0	0		17	0	15		7	370	0		0	1007	11	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	0	0	0		17	0	15		7	370	0		0	1007	11	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	0.75		1.00	1.00	0.75		1.00	1.00	0.75		1.00	1.00	0.75	
FinalVolume:	0	0	0		17	0	11		7	370	0		0	1007	8	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	0.00	1.00	0.00		0.60	0.00	0.40		1.00	2.00	0.00		1.00	1.98	0.02	
Final Sat.:	0	1700	0		1023	0	677		1700	3400	0		1700	3372	28	
Capacity Analysis Module:																
Vol/Sat:	0.00	0.00	0.00		0.01	0.00	0.02		0.00	0.11	0.00		0.00	0.30	0.30	
Crit Moves:							****		****					****		

Baker Ranch 30 Acre Residential Project
Forecast Opening Year Without Project Conditions
PM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #1 Lake Forest Dr / Rancho Pkwy

Cycle (sec): 100 Critical Vol./Cap.(X): 0.845
Loss Time (sec): 5 Average Delay (sec/veh): xxxxxx
Optimal Cycle: 64 Level Of Service: D

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1	0	2	0 1	1	0	2	0 1	1	0	1	0 1	1	0	2	0 1
Volume Module:																
Base Vol:	237	1073	452	99	848	58	27	419	100	272	305	160				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	237	1073	452	99	848	58	27	419	100	272	305	160				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Volume:	237	1073	452	99	848	58	27	419	100	272	305	160				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	237	1073	452	99	848	58	27	419	100	272	305	160				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75				
FinalVolume:	237	1073	339	99	848	44	27	419	75	272	305	120				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	2.00	1.00				
Final Sat.:	1700	3400	1700	1700	3400	1700	1700	1700	1700	1700	3400	1700				
Capacity Analysis Module:																
Vol/Sat:	0.14	0.32	0.20	0.06	0.25	0.03	0.02	0.25	0.04	0.16	0.09	0.07				
Crit Moves:	****				****			****		****						

Baker Ranch 30 Acre Residential Project
Forecast Opening Year Without Project Conditions
PM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #2 Portola Pkwy / Rancho Pkwy

Cycle (sec): 100 Critical Vol./Cap.(X): 0.499
Loss Time (sec): 5 Average Delay (sec/veh): xxxxxx
Optimal Cycle: 24 Level Of Service: A

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Protected				Protected				Split Phase				Split Phase			
Rights:	Include				Ovl				Ignore				Ovl			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2	0	3	0 1	2	0	3	0 1	1	1	0	0 1	1	1	0	1 1
Volume Module:																
Base Vol:	430	1590	4	37	1430	20	100	23	810	13	7	23				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	430	1590	4	37	1430	20	100	23	810	13	7	23				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Volume:	430	1590	4	37	1430	20	100	23	0	13	7	23				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	430	1590	4	37	1430	20	100	23	0	13	7	23				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.00	1.00	1.00	0.75				
FinalVolume:	430	1590	3	37	1430	15	100	23	0	13	7	17				
OvlAdjVol:						0						0				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	2.00	3.00	1.00	2.00	3.00	1.00	1.63	0.37	1.00	1.40	0.75	1.85				
Final Sat.:	3400	5100	1700	3400	5100	1700	2764	636	1700	2376	1279	3145				
Capacity Analysis Module:																
Vol/Sat:	0.13	0.31	0.00	0.01	0.28	0.01	0.04	0.04	0.00	0.01	0.01	0.01				
OvlAdjV/S:						0.00						0.00				
Crit Moves:	****				****		****				****					

Baker Ranch 30 Acre Residential Project
Forecast Opening Year Without Project Conditions
PM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #3 Portola Pwy / El Toro Rd

Cycle (sec):	100	Critical Vol./Cap.(X):	0.960
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	145	Level Of Service:	E

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Ignore				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2	0	4	0 1	2	0	3	0 1	1	0	3	0 1	1	0	3	0 1
Volume Module:																
Base Vol:	419	1031	40	415	1264	651	369	434	506	330	570	641				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	419	1031	40	415	1264	651	369	434	506	330	570	641				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Volume:	419	1031	40	415	1264	651	369	434	0	330	570	641				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	419	1031	40	415	1264	651	369	434	0	330	570	641				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.00	1.00	1.00	0.75				
FinalVolume:	419	1031	30	415	1264	488	369	434	0	330	570	481				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	2.00	4.00	1.00	2.00	3.00	1.00	1.00	3.00	1.00	1.00	3.00	1.00				
Final Sat.:	3400	6800	1700	3400	5100	1700	1700	5100	1700	1700	5100	1700				
Capacity Analysis Module:																
Vol/Sat:	0.12	0.15	0.02	0.12	0.25	0.29	0.22	0.09	0.00	0.19	0.11	0.28				
Crit Moves:	****					****	****					****				

Baker Ranch 30 Acre Residential Project
Forecast Opening Year Without Project Conditions
PM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #4 Sports Park / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.512
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	24	Level Of Service:	A

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Permitted				Permitted				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	0	0	1!	0 0	0	0	1!	0 0	1	0	1	1 0	1	0	1	1 0
Volume Module:																
Base Vol:	136	0	118	26	0	41	13	789	113	98	336	23				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	136	0	118	26	0	41	13	789	113	98	336	23				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Volume:	136	0	118	26	0	41	13	789	113	98	336	23				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	136	0	118	26	0	41	13	789	113	98	336	23				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75				
FinalVolume:	136	0	89	26	0	31	13	789	85	98	336	17				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	0.61	0.00	0.39	0.46	0.00	0.54	1.00	1.81	0.19	1.00	1.90	0.10				
Final Sat.:	1030	0	670	779	0	921	1700	3070	330	1700	3234	166				
Capacity Analysis Module:																
Vol/Sat:	0.08	0.00	0.13	0.02	0.00	0.03	0.01	0.26	0.26	0.06	0.10	0.10				
Crit Moves:			****	****				****		****						

Forecast Year 2015 With Project Conditions

Baker Ranch 30 Acre Residential Project
Forecast Opening Year With Project Conditions
AM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #1 Lake Forest Dr / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.629
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	31	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	-	R	L	- T	-	R	L	- T	-	R	L	- T	-	R
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1	0	2	0 1	1	0	2	0 1	1	0	1	0 1	1	0	2	0 1
Volume Module:																
Base Vol:	116	696	286	144	829	41	19	171	60	249	560	42				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	116	696	286	144	829	41	19	171	60	249	560	42				
Added Vol:	0	0	9	6	0	0	0	2	0	32	5	22				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	116	696	295	150	829	41	19	173	60	281	565	64				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Volume:	116	696	295	150	829	41	19	173	60	281	565	64				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	116	696	295	150	829	41	19	173	60	281	565	64				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75				
FinalVolume:	116	696	221	150	829	31	19	173	45	281	565	48				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	2.00	1.00				
Final Sat.:	1700	3400	1700	1700	3400	1700	1700	1700	1700	1700	3400	1700				
Capacity Analysis Module:																
Vol/Sat:	0.07	0.20	0.13	0.09	0.24	0.02	0.01	0.10	0.03	0.17	0.17	0.03				
Crit Moves:	****				****			****		****						

Baker Ranch 30 Acre Residential Project
Forecast Opening Year With Project Conditions
AM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #2 Portola Pkwy / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.529
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	25	Level Of Service:	A

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	-	R	L	- T	-	R	L	- T	-	R	L	- T	-	R
Control:	Protected				Protected				Split Phase				Split Phase			
Rights:	Include				Ovl				Ignore				Ovl			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2	0	3	0 1	2	0	3	0 1	1	1	0	0 1	1	1	0	1 1
Volume Module:																
Base Vol:	872	1291	12	223	830	108	49	58	280	21	38	73				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	872	1291	12	223	830	108	49	58	280	21	38	73				
Added Vol:	9	0	0	0	0	5	16	0	32	0	0	0				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	881	1291	12	223	830	113	65	58	312	21	38	73				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Volume:	881	1291	12	223	830	113	65	58	0	21	38	73				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	881	1291	12	223	830	113	65	58	0	21	38	73				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.00	1.00	1.00	0.75				
FinalVolume:	881	1291	9	223	830	85	65	58	0	21	38	55				
OvlAdjVol:						23						0				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	2.00	3.00	1.00	2.00	3.00	1.00	1.06	0.94	1.00	1.00	1.07	1.93				
Final Sat.:	3400	5100	1700	3400	5100	1700	1797	1603	1700	1700	1814	3286				
Capacity Analysis Module:																
Vol/Sat:	0.26	0.25	0.01	0.07	0.16	0.05	0.04	0.04	0.00	0.01	0.02	0.02				
OvlAdjV/S:						0.01						0.00				
Crit Moves:	****				****			****			****					

Baker Ranch 30 Acre Residential Project
Forecast Opening Year With Project Conditions
AM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #3 Portola Pwy / El Toro Rd

Cycle (sec):	100	Critical Vol./Cap.(X):	0.669
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	34	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Ignore				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2	0	4	0 1	2	0	3	0 1	1	0	3	0 1	1	0	3	0 1
Volume Module:																
Base Vol:	498	1611	18		50	668	355		328	172	305		49	498	255	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	498	1611	18		50	668	355		328	172	305		49	498	255	
Added Vol:	0	5	0		0	16	16		5	0	0		0	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	498	1616	18		50	684	371		333	172	305		49	498	255	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	0.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	0.00		1.00	1.00	1.00	
PHF Volume:	498	1616	18		50	684	371		333	172	0		49	498	255	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	498	1616	18		50	684	371		333	172	0		49	498	255	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	0.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	0.75		1.00	1.00	0.75		1.00	1.00	0.00		1.00	1.00	0.75	
FinalVolume:	498	1616	14		50	684	278		333	172	0		49	498	191	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	2.00	4.00	1.00		2.00	3.00	1.00		1.00	3.00	1.00		1.00	3.00	1.00	
Final Sat.:	3400	6800	1700		3400	5100	1700		1700	5100	1700		1700	5100	1700	
Capacity Analysis Module:																
Vol/Sat:	0.15	0.24	0.01		0.01	0.13	0.16		0.20	0.03	0.00		0.03	0.10	0.11	
Crit Moves:	****						****		****						****	

Baker Ranch 30 Acre Residential Project
Forecast Opening Year With Project Conditions
AM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #4 Sports Park / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.437
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	21	Level Of Service:	A

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Permitted				Permitted				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	0	0	1!	0 0	0	0	1!	0 0	1	0	1	1 0	1	0	1	1 0
Volume Module:																
Base Vol:	0	0	0		0	0	0		0	370	0		0	1007	0	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	0	0	0		0	0	0		0	370	0		0	1007	0	
Added Vol:	0	0	0		63	0	77		26	0	0		0	0	22	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	0	0	0		63	0	77		26	370	0		0	1007	22	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	0	0	0		63	0	77		26	370	0		0	1007	22	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	0	0	0		63	0	77		26	370	0		0	1007	22	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	0.75		1.00	1.00	0.75		1.00	1.00	0.75		1.00	1.00	0.75	
FinalVolume:	0	0	0		63	0	58		26	370	0		0	1007	17	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	0.00	1.00	0.00		0.52	0.00	0.48		1.00	2.00	0.00		1.00	1.97	0.03	
Final Sat.:	0	1700	0		887	0	813		1700	3400	0		1700	3345	55	
Capacity Analysis Module:																
Vol/Sat:	0.00	0.00	0.00		0.04	0.00	0.07		0.02	0.11	0.00		0.00	0.30	0.30	
Crit Moves:							****		****					****		

Baker Ranch 30 Acre Residential Project
Forecast Opening Year With Project Conditions
PM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #1 Lake Forest Dr / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.854
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	66	Level Of Service:	D

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	-	R	L	- T	-	R	L	- T	-	R	L	- T	-	R
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1	0 2	0	1	1	0 2	0	1	1	0 1	0	1	1	0 2	0	1
Volume Module:																
Base Vol:	237	1073	452		99	848	58		27	419	100		272	305	160	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	237	1073	452		99	848	58		27	419	100		272	305	160	
Added Vol:	0	0	37		24	0	0		0	6	0		8	1	5	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	237	1073	489		123	848	58		27	425	100		280	306	165	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	237	1073	489		123	848	58		27	425	100		280	306	165	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	237	1073	489		123	848	58		27	425	100		280	306	165	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	0.75		1.00	1.00	0.75		1.00	1.00	0.75		1.00	1.00	0.75	
FinalVolume:	237	1073	367		123	848	44		27	425	75		280	306	124	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	2.00	1.00		1.00	2.00	1.00		1.00	1.00	1.00		1.00	2.00	1.00	
Final Sat.:	1700	3400	1700		1700	3400	1700		1700	1700	1700		1700	3400	1700	
Capacity Analysis Module:																
Vol/Sat:	0.14	0.32	0.22		0.07	0.25	0.03		0.02	0.25	0.04		0.16	0.09	0.07	
Crit Moves:	****					****				****			****			

Baker Ranch 30 Acre Residential Project
Forecast Opening Year With Project Conditions
PM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #2 Portola Pkwy / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.511
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	24	Level Of Service:	A

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	-	R	L	- T	-	R	L	- T	-	R	L	- T	-	R
Control:	Protected				Protected				Split Phase				Split Phase			
Rights:	Include				Ovl				Ignore				Ovl			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2	0 3	0	1	2	0 3	0	1	1	1 0	0	1	1	1 0	1	1
Volume Module:																
Base Vol:	430	1590	4		37	1430	20		100	23	810		13	7	23	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	430	1590	4		37	1430	20		100	23	810		13	7	23	
Added Vol:	37	0	0		0	0	18		4	0	8		0	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	467	1590	4		37	1430	38		104	23	818		13	7	23	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	0.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	0.00		1.00	1.00	1.00	
PHF Volume:	467	1590	4		37	1430	38		104	23	0		13	7	23	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	467	1590	4		37	1430	38		104	23	0		13	7	23	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	0.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	0.75		1.00	1.00	0.75		1.00	1.00	0.00		1.00	1.00	0.75	
FinalVolume:	467	1590	3		37	1430	29		104	23	0		13	7	17	
OvlAdjVol:							0								0	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	2.00	3.00	1.00		2.00	3.00	1.00		1.64	0.36	1.00		1.40	0.75	1.85	
Final Sat.:	3400	5100	1700		3400	5100	1700		2784	616	1700		2376	1279	3145	
Capacity Analysis Module:																
Vol/Sat:	0.14	0.31	0.00		0.01	0.28	0.02		0.04	0.04	0.00		0.01	0.01	0.01	
OvlAdjV/S:							0.00								0.00	
Crit Moves:	****					****				****				****		

Baker Ranch 30 Acre Residential Project
Forecast Opening Year With Project Conditions
PM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #3 Portola Pwy / El Toro Rd

Cycle (sec):	100	Critical Vol./Cap.(X):	0.973
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	168	Level Of Service:	E

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Ignore				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2	0	4	0 1	2	0	3	0 1	1	0	3	0 1	1	0	3	0 1
Volume Module:																
Base Vol:	419	1031	40	415	1264	651	369	434	506	330	570	641				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	419	1031	40	415	1264	651	369	434	506	330	570	641				
Added Vol:	0	18	0	0	4	4	18	0	0	0	0	0				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	419	1049	40	415	1268	655	387	434	506	330	570	641				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Volume:	419	1049	40	415	1268	655	387	434	0	330	570	641				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	419	1049	40	415	1268	655	387	434	0	330	570	641				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.00	1.00	1.00	0.75				
FinalVolume:	419	1049	30	415	1268	491	387	434	0	330	570	481				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	2.00	4.00	1.00	2.00	3.00	1.00	1.00	3.00	1.00	1.00	3.00	1.00				
Final Sat.:	3400	6800	1700	3400	5100	1700	1700	5100	1700	1700	5100	1700				
Capacity Analysis Module:																
Vol/Sat:	0.12	0.15	0.02	0.12	0.25	0.29	0.23	0.09	0.00	0.19	0.11	0.28				
Crit Moves:	****					****	****					****				

Baker Ranch 30 Acre Residential Project
Forecast Opening Year With Project Conditions
PM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #4 Sports Park / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.521
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	25	Level Of Service:	A

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Permitted				Permitted				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	0	0	1!	0 0	0	0	1!	0 0	1	0	1	1 0	1	0	1	1 0
Volume Module:																
Base Vol:	136	0	118	0	0	0	0	789	113	98	336	0				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	136	0	118	0	0	0	0	789	113	98	336	0				
Added Vol:	0	0	0	42	0	51	87	0	0	0	0	71				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	136	0	118	42	0	51	87	789	113	98	336	71				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Volume:	136	0	118	42	0	51	87	789	113	98	336	71				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	136	0	118	42	0	51	87	789	113	98	336	71				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75				
FinalVolume:	136	0	89	42	0	38	87	789	85	98	336	53				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	0.61	0.00	0.39	0.52	0.00	0.48	1.00	1.81	0.19	1.00	1.73	0.27				
Final Sat.:	1030	0	670	890	0	810	1700	3070	330	1700	2935	465				
Capacity Analysis Module:																
Vol/Sat:	0.08	0.00	0.13	0.02	0.00	0.05	0.05	0.26	0.26	0.06	0.11	0.11				
Crit Moves:			****	****				****		****						

Forecast Year 2030 Without Project Conditions

Baker Ranch 30 Acre Residential Project
Forecast Year 2030 Without Project Conditions
AM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #1 Lake Forest Dr / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.662
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	33	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1	0	2	0 1	2	0	2	0 1	1	0	2	0 1	2	0	2	0 1
Volume Module:																
Base Vol:	195	745	408	206	825	230	42	297	90	568	758	74				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	195	745	408	206	825	230	42	297	90	568	758	74				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Volume:	195	745	408	206	825	230	42	297	90	568	758	74				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	195	745	408	206	825	230	42	297	90	568	758	74				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75				
FinalVolume:	195	745	306	206	825	173	42	297	68	568	758	56				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	1.00	2.00	1.00	2.00	2.00	1.00	1.00	2.00	1.00	2.00	2.00	1.00				
Final Sat.:	1700	3400	1700	3400	3400	1700	1700	3400	1700	3400	3400	1700				
Capacity Analysis Module:																
Vol/Sat:	0.11	0.22	0.18	0.06	0.24	0.10	0.02	0.09	0.04	0.17	0.22	0.03				
Crit Moves:	****				****			****		****						

Baker Ranch 30 Acre Residential Project
Forecast Year 2030 Without Project Conditions
AM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #2 Portola Pkwy / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.624
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	31	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Protected				Protected				Split Phase				Split Phase			
Rights:	Include				Ovl				Ignore				Ovl			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2	0	3	0 1	2	0	3	0 1	1	1	0	0 1	1	1	0	1 1
Volume Module:																
Base Vol:	1246	1322	12	223	747	344	78	58	493	21	38	73				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	1246	1322	12	223	747	344	78	58	493	21	38	73				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Volume:	1246	1322	12	223	747	344	78	58	0	21	38	73				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	1246	1322	12	223	747	344	78	58	0	21	38	73				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.00	1.00	1.00	0.75				
FinalVolume:	1246	1322	9	223	747	258	78	58	0	21	38	55				
OvlAdjVol:						190						0				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	2.00	3.00	1.00	2.00	3.00	1.00	1.15	0.85	1.00	1.00	1.07	1.93				
Final Sat.:	3400	5100	1700	3400	5100	1700	1950	1450	1700	1700	1814	3286				
Capacity Analysis Module:																
Vol/Sat:	0.37	0.26	0.01	0.07	0.15	0.15	0.04	0.04	0.00	0.01	0.02	0.02				
OvlAdjV/S:						0.11						0.00				
Crit Moves:	****				****			****			****					

Baker Ranch 30 Acre Residential Project
Forecast Year 2030 Without Project Conditions
AM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #3 Portola Pwy / El Toro Rd

Cycle (sec):	100	Critical Vol./Cap.(X):	0.700
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	37	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Ignore				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2	0	4	0 1	2	0	3	0 1	2	0	3	0 1	1	0	3	0 2
Volume Module:																
Base Vol:	567	1995	19	71	618	422	450	152	297	59	838	381				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	567	1995	19	71	618	422	450	152	297	59	838	381				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Volume:	567	1995	19	71	618	422	450	152	0	59	838	381				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	567	1995	19	71	618	422	450	152	0	59	838	381				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.00	1.00	1.00	0.75				
FinalVolume:	567	1995	14	71	618	317	450	152	0	59	838	286				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	2.00	4.00	1.00	2.00	3.00	1.00	2.00	3.00	1.00	1.00	3.00	2.00				
Final Sat.:	3400	6800	1700	3400	5100	1700	3400	5100	1700	1700	5100	3400				
Capacity Analysis Module:																
Vol/Sat:	0.17	0.29	0.01	0.02	0.12	0.19	0.13	0.03	0.00	0.03	0.16	0.08				
Crit Moves:	****					****	****				****					

Baker Ranch 30 Acre Residential Project
Forecast Year 2030 Without Project Conditions
AM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #4 Sports Park / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.651
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	33	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Permitted				Permitted				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	0	0	1!	0 0	0	0	1!	0 0	1	0	1	1 0	1	0	1	1 0
Volume Module:																
Base Vol:	0	0	0	55	0	68	113	574	0	0	1536	92				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	0	0	0	55	0	68	113	574	0	0	1536	92				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Volume:	0	0	0	55	0	68	113	574	0	0	1536	92				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	0	0	0	55	0	68	113	574	0	0	1536	92				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75				
FinalVolume:	0	0	0	55	0	51	113	574	0	0	1536	69				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	0.00	1.00	0.00	0.52	0.00	0.48	1.00	2.00	0.00	1.00	1.91	0.09				
Final Sat.:	0	1700	0	882	0	818	1700	3400	0	1700	3254	146				
Capacity Analysis Module:																
Vol/Sat:	0.00	0.00	0.00	0.03	0.00	0.06	0.07	0.17	0.00	0.00	0.47	0.47				
Crit Moves:						****	****				****					

Baker Ranch 30 Acre Residential Project
Forecast Year 2030 Without Project Conditions
PM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #1 Lake Forest Dr / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.832
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	60	Level Of Service:	D

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1	0	2	0 1	2	0	2	0 1	1	0	2	0 1	2	0	2	0 1
Volume Module:																
Base Vol:	310	1210	630	150	920	110	140	700	190	420	550	230				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	310	1210	630	150	920	110	140	700	190	420	550	230				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Volume:	310	1210	630	150	920	110	140	700	190	420	550	230				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	310	1210	630	150	920	110	140	700	190	420	550	230				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75				
FinalVolume:	310	1210	473	150	920	83	140	700	143	420	550	173				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	1.00	2.00	1.00	2.00	2.00	1.00	1.00	2.00	1.00	2.00	2.00	1.00				
Final Sat.:	1700	3400	1700	3400	3400	1700	1700	3400	1700	3400	3400	1700				
Capacity Analysis Module:																
Vol/Sat:	0.18	0.36	0.28	0.04	0.27	0.05	0.08	0.21	0.08	0.12	0.16	0.10				
Crit Moves:	****				****			****		****						

Baker Ranch 30 Acre Residential Project
Forecast Year 2030 Without Project Conditions
PM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #2 Portola Pkwy / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.621
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	30	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Protected				Protected				Split Phase				Split Phase			
Rights:	Include				Ovl				Ignore				Ovl			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2	0	3	0 1	2	0	3	0 1	1	1	0	0 1	1	1	0	1 1
Volume Module:																
Base Vol:	730	1610	4	37	1508	102	163	23	1298	13	7	23				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	730	1610	4	37	1508	102	163	23	1298	13	7	23				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Volume:	730	1610	4	37	1508	102	163	23	0	13	7	23				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	730	1610	4	37	1508	102	163	23	0	13	7	23				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.00	1.00	1.00	0.75				
FinalVolume:	730	1610	3	37	1508	77	163	23	0	13	7	17				
OvlAdjVol:						0						0				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	2.00	3.00	1.00	2.00	3.00	1.00	1.75	0.25	1.00	1.40	0.75	1.85				
Final Sat.:	3400	5100	1700	3400	5100	1700	2980	420	1700	2376	1279	3145				
Capacity Analysis Module:																
Vol/Sat:	0.21	0.32	0.00	0.01	0.30	0.05	0.05	0.05	0.00	0.01	0.01	0.01				
OvlAdjV/S:						0.00						0.00				
Crit Moves:	****				****		****				****					

Baker Ranch 30 Acre Residential Project
Forecast Year 2030 Without Project Conditions
PM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #3 Portola Pwy / El Toro Rd

Cycle (sec):	100	Critical Vol./Cap.(X):	0.859
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	68	Level Of Service:	D

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Ignore				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2	0	4	0 1	2	0	3	0 1	2	0	3	0 1	1	0	3	0 2
Volume Module:																
Base Vol:	386	1123	49	560	1671	834	476	661	501	337	620	741				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	386	1123	49	560	1671	834	476	661	501	337	620	741				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Volume:	386	1123	49	560	1671	834	476	661	0	337	620	741				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	386	1123	49	560	1671	834	476	661	0	337	620	741				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.00	1.00	1.00	0.75				
FinalVolume:	386	1123	37	560	1671	626	476	661	0	337	620	556				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	2.00	4.00	1.00	2.00	3.00	1.00	2.00	3.00	1.00	1.00	3.00	2.00				
Final Sat.:	3400	6800	1700	3400	5100	1700	3400	5100	1700	1700	5100	3400				
Capacity Analysis Module:																
Vol/Sat:	0.11	0.17	0.02	0.16	0.33	0.37	0.14	0.13	0.00	0.20	0.12	0.16				
Crit Moves:	****					****		****		****						

Baker Ranch 30 Acre Residential Project
Forecast Year 2030 Without Project Conditions
PM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Base Volume Alternative)

Intersection #4 Sports Park / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.859
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	68	Level Of Service:	D

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Permitted				Permitted				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	0	0	1!	0 0	0	0	1!	0 0	1	0	1	1 0	1	0	1	1 0
Volume Module:																
Base Vol:	136	0	118	297	0	362	334	1069	113	98	467	274				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	136	0	118	297	0	362	334	1069	113	98	467	274				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Volume:	136	0	118	297	0	362	334	1069	113	98	467	274				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	136	0	118	297	0	362	334	1069	113	98	467	274				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75				
FinalVolume:	136	0	89	297	0	272	334	1069	85	98	467	206				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	0.61	0.00	0.39	0.52	0.00	0.48	1.00	1.85	0.15	1.00	1.39	0.61				
Final Sat.:	1030	0	670	888	0	812	1700	3150	250	1700	2361	1039				
Capacity Analysis Module:																
Vol/Sat:	0.08	0.00	0.13	0.17	0.00	0.33	0.20	0.34	0.34	0.06	0.20	0.20				
Crit Moves:	****					****	****				****					

Forecast Year 2030 With Project Conditions

Baker Ranch 30 Acre Residential Project
Forecast Year 2030 With Project Conditions
AM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #1 Lake Forest Dr / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.661
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	33	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	1	0	2	0	1	2	0	2	0	1	1	0	2	0	1	
Volume Module:																
Base Vol:	195	745	408		206	825	230		42	297	90		568	758	74	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	195	745	408		206	825	230		42	297	90		568	758	74	
Added Vol:	0	0	-47		-31	0	0		0	-8	0		5	1	3	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	195	745	361		175	825	230		42	289	90		573	759	77	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	195	745	361		175	825	230		42	289	90		573	759	77	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	195	745	361		175	825	230		42	289	90		573	759	77	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	0.75		1.00	1.00	0.75		1.00	1.00	0.75		1.00	1.00	0.75	
FinalVolume:	195	745	271		175	825	173		42	289	68		573	759	58	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	1.00	2.00	1.00		2.00	2.00	1.00		1.00	2.00	1.00		2.00	2.00	1.00	
Final Sat.:	1700	3400	1700		3400	3400	1700		1700	3400	1700		3400	3400	1700	
Capacity Analysis Module:																
Vol/Sat:	0.11	0.22	0.16		0.05	0.24	0.10		0.02	0.09	0.04		0.17	0.22	0.03	
Crit Moves:	****					****				****			****			

Baker Ranch 30 Acre Residential Project
Forecast Year 2030 With Project Conditions
AM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #2 Portola Pkwy / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.611
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	30	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Protected				Protected				Split Phase				Split Phase			
Rights:	Include				Ovl				Ignore				Ovl			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Y+R:	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0	4.0	
Lanes:	2	0	3	0	1	2	0	3	0	1	1	1	0	0	1	
Volume Module:																
Base Vol:	1246	1322	12		223	747	344		78	58	493		21	38	73	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	1246	1322	12		223	747	344		78	58	493		21	38	73	
Added Vol:	-47	0	0		0	0	-24		3	0	5		0	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	1199	1322	12		223	747	320		81	58	498		21	38	73	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	0.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	0.00		1.00	1.00	1.00	
PHF Volume:	1199	1322	12		223	747	320		81	58	0		21	38	73	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	1199	1322	12		223	747	320		81	58	0		21	38	73	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	0.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	0.75		1.00	1.00	0.75		1.00	1.00	0.00		1.00	1.00	0.75	
FinalVolume:	1199	1322	9		223	747	240		81	58	0		21	38	55	
OvlAdjVol:							170								0	
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700		1700	1700	1700		1700	1700	1700		1700	1700	1700	
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	2.00	3.00	1.00		2.00	3.00	1.00		1.17	0.83	1.00		1.00	1.07	1.93	
Final Sat.:	3400	5100	1700		3400	5100	1700		1981	1419	1700		1700	1814	3286	
Capacity Analysis Module:																
Vol/Sat:	0.35	0.26	0.01		0.07	0.15	0.14		0.04	0.04	0.00		0.01	0.02	0.02	
OvlAdjV/S:							0.10								0.00	
Crit Moves:	****					****			****					****		

Baker Ranch 30 Acre Residential Project
Forecast Year 2030 With Project Conditions
AM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #3 Portola Pwy / El Toro Rd

Cycle (sec):	100	Critical Vol./Cap.(X):	0.694
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	37	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Ignore				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2	0	4	0 1	2	0	3	0 1	2	0	3	0 1	1	0	3	0 2
Volume Module:																
Base Vol:	567	1995	19	71	618	422	450	152	297	59	838	381				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	567	1995	19	71	618	422	450	152	297	59	838	381				
Added Vol:	0	-24	0	0	3	3	-24	0	0	0	0	0				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	567	1971	19	71	621	425	426	152	297	59	838	381				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Volume:	567	1971	19	71	621	425	426	152	0	59	838	381				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	567	1971	19	71	621	425	426	152	0	59	838	381				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.00	1.00	1.00	0.75				
FinalVolume:	567	1971	14	71	621	319	426	152	0	59	838	286				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	2.00	4.00	1.00	2.00	3.00	1.00	2.00	3.00	1.00	1.00	3.00	2.00				
Final Sat.:	3400	6800	1700	3400	5100	1700	3400	5100	1700	1700	5100	3400				
Capacity Analysis Module:																
Vol/Sat:	0.17	0.29	0.01	0.02	0.12	0.19	0.13	0.03	0.00	0.03	0.16	0.08				
Crit Moves:	****					****	****				****					

Baker Ranch 30 Acre Residential Project
Forecast Year 2030 With Project Conditions
AM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #4 Sports Park / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.593
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	28	Level Of Service:	A

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Permitted				Permitted				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	0	0	1!	0 0	0	0	1!	0 0	1	0	1	1 0	1	0	1	1 0
Volume Module:																
Base Vol:	0	0	0	0	0	0	0	0	574	0	0	1536	0			
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Initial Bse:	0	0	0	0	0	0	0	574	0	0	1536	0				
Added Vol:	0	0	0	63	0	77	26	0	0	0	0	22				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	0	0	0	63	0	77	26	574	0	0	1536	22				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Volume:	0	0	0	63	0	77	26	574	0	0	1536	22				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	0	0	0	63	0	77	26	574	0	0	1536	22				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75				
FinalVolume:	0	0	0	63	0	58	26	574	0	0	1536	17				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	0.00	1.00	0.00	0.52	0.00	0.48	1.00	2.00	0.00	1.00	1.98	0.02				
Final Sat.:	0	1700	0	887	0	813	1700	3400	0	1700	3364	36				
Capacity Analysis Module:																
Vol/Sat:	0.00	0.00	0.00	0.04	0.00	0.07	0.02	0.17	0.00	0.00	0.46	0.46				
Crit Moves:						****	****				****					

Baker Ranch 30 Acre Residential Project
Forecast Year 2030 With Project Conditions
PM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #1 Lake Forest Dr / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.776
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	47	Level Of Service:	C

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	-	R	L	- T	-	R	L	- T	-	R	L	- T	-	R
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	1	0	2	0 1	2	0	2	0 1	1	0	2	0 1	2	0	2	0 1
Volume Module:																
Base Vol:	310	1210	630	150	920	110	140	700	190	420	550	230				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	310	1210	630	150	920	110	140	700	190	420	550	230				
Added Vol:	0	0	-135	-90	0	0	0	-23	0	-170	-28	-113				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	310	1210	495	60	920	110	140	677	190	250	522	117				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Volume:	310	1210	495	60	920	110	140	677	190	250	522	117				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	310	1210	495	60	920	110	140	677	190	250	522	117				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75				
FinalVolume:	310	1210	371	60	920	83	140	677	143	250	522	88				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	1.00	2.00	1.00	2.00	2.00	1.00	1.00	2.00	1.00	2.00	2.00	1.00				
Final Sat.:	1700	3400	1700	3400	3400	1700	1700	3400	1700	3400	3400	1700				
Capacity Analysis Module:																
Vol/Sat:	0.18	0.36	0.22	0.02	0.27	0.05	0.08	0.20	0.08	0.07	0.15	0.05				
Crit Moves:	****				****			****		****						

Baker Ranch 30 Acre Residential Project
Forecast Year 2030 With Project Conditions
PM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #2 Portola Pkwy / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.556
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	26	Level Of Service:	A

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	-	R	L	- T	-	R	L	- T	-	R	L	- T	-	R
Control:	Protected				Protected				Split Phase				Split Phase			
Rights:	Include				Ovl				Ignore				Ovl			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2	0	3	0 1	2	0	3	0 1	1	1	0	0 1	1	1	0	1 1
Volume Module:																
Base Vol:	730	1610	4	37	1508	102	163	23	1298	13	7	23				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	730	1610	4	37	1508	102	163	23	1298	13	7	23				
Added Vol:	-135	0	0	0	0	-68	-85	0	-170	0	0	0				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	595	1610	4	37	1508	34	78	23	1128	13	7	23				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Volume:	595	1610	4	37	1508	34	78	23	0	13	7	23				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	595	1610	4	37	1508	34	78	23	0	13	7	23				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.00	1.00	1.00	0.75				
FinalVolume:	595	1610	3	37	1508	26	78	23	0	13	7	17				
OvlAdjVol:						0						0				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	2.00	3.00	1.00	2.00	3.00	1.00	1.54	0.46	1.00	1.40	0.75	1.85				
Final Sat.:	3400	5100	1700	3400	5100	1700	2626	774	1700	2376	1279	3145				
Capacity Analysis Module:																
Vol/Sat:	0.17	0.32	0.00	0.01	0.30	0.02	0.03	0.03	0.00	0.01	0.01	0.01				
OvlAdjV/S:						0.00						0.00				
Crit Moves:	****				****		****				****					

Baker Ranch 30 Acre Residential Project
Forecast Year 2030 With Project Conditions
PM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #3 Portola Pwy / El Toro Rd

Cycle (sec):	100	Critical Vol./Cap.(X):	0.822
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	57	Level Of Service:	D

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Protected				Protected				Protected				Protected			
Rights:	Include				Include				Ignore				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	2	0	4	0 1	2	0	3	0 1	2	0	3	0 1	1	0	3	0 2
Volume Module:																
Base Vol:	386	1123	49	560	1671	834	476	661	501	337	620	741				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	386	1123	49	560	1671	834	476	661	501	337	620	741				
Added Vol:	0	-68	0	0	-85	-85	-68	0	0	0	0	0				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	386	1055	49	560	1586	749	408	661	501	337	620	741				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
PHF Volume:	386	1055	49	560	1586	749	408	661	0	337	620	741				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	386	1055	49	560	1586	749	408	661	0	337	620	741				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.00	1.00	1.00	0.75				
FinalVolume:	386	1055	37	560	1586	562	408	661	0	337	620	556				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	2.00	4.00	1.00	2.00	3.00	1.00	2.00	3.00	1.00	1.00	3.00	2.00				
Final Sat.:	3400	6800	1700	3400	5100	1700	3400	5100	1700	1700	5100	3400				
Capacity Analysis Module:																
Vol/Sat:	0.11	0.16	0.02	0.16	0.31	0.33	0.12	0.13	0.00	0.20	0.12	0.16				
Crit Moves:	****					****		****		****						

Baker Ranch 30 Acre Residential Project
Forecast Year 2030 With Project Conditions
PM Peak Hour

Level Of Service Computation Report
ICU 1(Loss as Cycle Length %) Method (Future Volume Alternative)

Intersection #4 Sports Park / Rancho Pkwy

Cycle (sec):	100	Critical Vol./Cap.(X):	0.604
Loss Time (sec):	5	Average Delay (sec/veh):	xxxxxx
Optimal Cycle:	29	Level Of Service:	B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Permitted				Permitted				Protected				Protected			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Y+R:	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lanes:	0	0	1!	0 0	0	0	1!	0 0	1	0	1	1 0	1	0	1	1 0
Volume Module:																
Base Vol:	136	0	118	0	0	0	0	1069	113	98	467	0				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	136	0	118	0	0	0	0	1069	113	98	467	0				
Added Vol:	0	0	0	42	0	51	87	0	0	0	0	71				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	136	0	118	42	0	51	87	1069	113	98	467	71				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Volume:	136	0	118	42	0	51	87	1069	113	98	467	71				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	136	0	118	42	0	51	87	1069	113	98	467	71				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75	1.00	1.00	0.75				
FinalVolume:	136	0	89	42	0	38	87	1069	85	98	467	53				
Saturation Flow Module:																
Sat/Lane:	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700				
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	0.61	0.00	0.39	0.52	0.00	0.48	1.00	1.85	0.15	1.00	1.80	0.20				
Final Sat.:	1030	0	670	890	0	810	1700	3150	250	1700	3052	348				
Capacity Analysis Module:																
Vol/Sat:	0.08	0.00	0.13	0.02	0.00	0.05	0.05	0.34	0.34	0.06	0.15	0.15				
Crit Moves:			****	****				****		****						

Appendix J

Conditional Water and Sewer Will Serve Letter

IRVINE RANCH WATER DISTRICT 15600 Sand Canyon Ave., P.O. Box 57000, Irvine, CA 92619-7000 (949) 453-5300

March 5, 2014

Mr. David Belmer
Assistant City Manager
City of Lake Forest
25550 Commerce Center Drive
Lake Forest, CA 92630

SUBJECT: Conditional Water and Sewer Will Serve Letter for Proposed Development in Baker Ranch, Lake Forest, California at Rancho Parkway and Portola Parkway, Tentative Tract Map 17707

Gentlemen:

This is to advise you that the IRWD would have adequate domestic water supplies to furnish each and every building lot, without exception, in the tentative tract, subject to the developer providing for construction of additional water supply and transmission mains as may be identified in a future Sub Area Master Plan update, and the developer installing the necessary in-tract distribution main.

Please be advised that for residential tracts, two (2) points of connection must be made to IRWD's water system, and may necessitate street trenching or underground boring if not done prior to road construction.

The District will also be able to provide sewer service to each and every building lot, without exception, in the tentative tract, conditioned upon the developer providing for the construction of additional sewer trunk lines and local sewer collection facilities, as may be identified in a future Sub Area Master Plan update, and the developer installing the necessary in-tract sewer mains.

This letter does not constitute either a water supply verification, as required by California Government Code Section 66473.7, or a water supply assessment, as required by California Water Code Section 10910. If compliance with one or both of such requirements is necessary for the project, appropriate requests shall be submitted to the District.

If you have any questions or require any additional information, please feel free to call the undersigned.

Yours truly,

Kevin L. Burton

Kevin L. Burton, P.E.
Executive Director of Engineering and Water Quality

Reviewed: KNL