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

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

 ************************* DESCRIPTION OF STUDY *************************
* Serrano Highlands Hydrology Analysis                                  *
* Existing Condition, Drainage Area "B"                                 *
* 10-year Storm                                                         *
 ************************************************************************

  FILE NAME: SERRANOE.DAT
  TIME/DATE OF STUDY: 09:58 07/22/2011
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)     SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  =====  ====  =====  =======
  1   14.0       9.0   0.020/0.020/0.020    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      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) =   203.00
  ELEVATION DATA: UPSTREAM(FEET) =    690.00  DOWNSTREAM(FEET) =    650.00
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =  10.837
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.606
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "OPEN BRUSH"                C        0.32      0.25      1.000    75   10.84
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.68
  TOTAL AREA(ACRES) =      0.32   PEAK FLOW RATE(CFS) =      0.68

**************************************************************************
  FLOW PROCESS FROM NODE      21.00 TO NODE      22.00 IS CODE =  52
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    650.00  DOWNSTREAM(FEET) =    572.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   879.00   CHANNEL SLOPE =  0.0887
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.68
  FLOW VELOCITY(FEET/SEC) =   4.47 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   3.28   Tc(MIN.) =  14.12
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =    1082.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE      22.00 TO NODE      22.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN) =  14.12
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.240
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL GOOD COVER
  "OPEN BRUSH"                D        6.00      0.20      1.000    81
  NATURAL GOOD COVER
  "OPEN BRUSH"                C        0.28      0.25      1.000    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =     6.28      SUBAREA RUNOFF(CFS) =    11.52
  EFFECTIVE AREA(ACRES) =      6.60   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =        6.6       PEAK FLOW RATE(CFS) =      12.09
==========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =        6.6  TC(MIN.) =     14.12
  EFFECTIVE AREA(ACRES) =      6.60  AREA-AVERAGED Fm(INCH/HR)=  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)    =      12.09
==========================================================================
==========================================================================
```

END OF RATIONAL METHOD ANALYSIS

B. 25-YEAR STORM

```
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                        Analysis prepared by:

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

 ************************* DESCRIPTION OF STUDY *************************
* Hydrology Study for Serrano Highlands, Tract 15594                    *
* Existing Condition, Drainage Area "A"                                 *
* 25-year Storm                                                         *
 ************************************************************************

  FILE NAME: E3.DAT
  TIME/DATE OF STUDY: 07:55 06/16/2011
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

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

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)     SIDE / SIDE/ WAY    (FT)   (FT)   (FT)  (FT)    (n)
===  =====  =========  ==================  ======  =====  ======  =====  =======
  1   14.0       9.0   0.020/0.020/0.020    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      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) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =     695.00  DOWNSTREAM(FEET) =     640.00
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.853
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.827
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "OPEN BRUSH"               D        1.00      0.20      1.000    81   12.85
  NATURAL GOOD COVER
  "OPEN BRUSH"               B        0.23      0.30      1.000    63   12.85
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.22
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.89
  TOTAL AREA(ACRES) =      1.23   PEAK FLOW RATE(CFS) =      2.89

**************************************************************************
  FLOW PROCESS FROM NODE      31.00 TO NODE      32.00 IS CODE =  52
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    640.00  DOWNSTREAM(FEET) =    574.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1122.00   CHANNEL SLOPE =  0.0588
  CHANNEL FLOW THRU SUBAREA(CFS) =      2.89
  FLOW VELOCITY(FEET/SEC) =   4.52 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   4.14   Tc(MIN.) =  16.99
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =    1422.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE      32.00 TO NODE      32.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN) =  16.99
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.414
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL GOOD COVER
  "OPEN BRUSH"               D       10.80      0.20      1.000    81
  NATURAL GOOD COVER
  "OPEN BRUSH"               C        3.10      0.25      1.000    75
  NATURAL GOOD COVER
  "OPEN BRUSH"               B        8.50      0.30      1.000    63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.24
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   22.40     SUBAREA RUNOFF(CFS) =   43.72
  EFFECTIVE AREA(ACRES) =    23.63   AREA-AVERAGED Fm(INCH/HR) =  0.24
  AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =      23.6      PEAK FLOW RATE(CFS) =      46.15
==========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =      23.6  TC(MIN.) =    16.99
  EFFECTIVE AREA(ACRES) =    23.63  AREA-AVERAGED Fm(INCH/HR)=  0.24
  AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap = 1.000
```

PEAK FLOW RATE(CFS) = 46.15

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END OF RATIONAL METHOD ANALYSIS

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                      Analysis prepared by:

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

 ************************* DESCRIPTION OF STUDY *************************
* Hydrology Study for Serrano Highlands, Tract 15594                    *
* Existing Condition, Drainage Area "B"                                 *
* 25-year Storm                                                         *
 **************************************************************************

  FILE NAME: E2.DAT
  TIME/DATE OF STUDY: 07:58 06/16/2011
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

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

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)     SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  =====  ====  =====  =======
  1   14.0      9.0    0.020/0.020/0.020    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) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =    611.00  DOWNSTREAM(FEET) =    587.00
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   15.172
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.574
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "OPEN BRUSH"                D        1.26      0.20      1.000    81   15.17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.69
  TOTAL AREA(ACRES) =      1.26   PEAK FLOW RATE(CFS) =      2.69

**************************************************************************
  FLOW PROCESS FROM NODE       2.00 TO NODE       3.00 IS CODE =  52
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    587.00  DOWNSTREAM(FEET) =    579.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   230.00   CHANNEL SLOPE =  0.0348
  CHANNEL FLOW THRU SUBAREA(CFS) =      2.69
  FLOW VELOCITY(FEET/SEC) =   3.42 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.12   Tc(MIN.) =  16.29
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     530.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE       3.00 TO NODE       3.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN) =  16.29
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.472
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL GOOD COVER
  "OPEN BRUSH"                D        1.09      0.20      1.000    81
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =     1.09      SUBAREA RUNOFF(CFS) =     2.23
  EFFECTIVE AREA(ACRES) =      2.35   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =        2.3       PEAK FLOW RATE(CFS) =       4.80
==========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =        2.3  TC(MIN.) =     16.29
  EFFECTIVE AREA(ACRES) =       2.35  AREA-AVERAGED Fm(INCH/HR)=  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)    =       4.80
==========================================================================
==========================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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                        Analysis prepared by:

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

 ************************* DESCRIPTION OF STUDY *************************
* Hydrology Study for Serrano Highlands, Tract 15594                    *
* Existing Condition, Drainage Area "B"                                 *
* 25-year Storm                                                         *
 **************************************************************************

  FILE NAME: E1.DAT
  TIME/DATE OF STUDY: 07:56 06/16/2011
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

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

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)     SIDE / SIDE/ WAY    (FT)    (FT)   (FT)  (FT)    (n)
===  =====  =========  ==================  ======  =====  ======  =====  =======
  1   14.0       9.0   0.020/0.020/0.020    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      10.00 TO NODE      11.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    266.00
  ELEVATION DATA: UPSTREAM(FEET) =     650.00  DOWNSTREAM(FEET) =     610.00
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.745
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.840
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP    (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "OPEN BRUSH"                D        0.71      0.20      1.000     81   12.74
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =       1.69
  TOTAL AREA(ACRES) =       0.71   PEAK FLOW RATE(CFS) =       1.69

**************************************************************************
  FLOW PROCESS FROM NODE      11.00 TO NODE      12.00 IS CODE =  61
--------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
==========================================================================
  UPSTREAM ELEVATION(FEET) =  610.00  DOWNSTREAM ELEVATION(FEET) =  582.00
  STREET LENGTH(FEET) =   489.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 17.60

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  12.60
  INSIDE STREET CROSSFALL(DECIMAL) =  0.017
  OUTSIDE STREET CROSSFALL(DECIMAL) =  0.017

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.85
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.22
    HALFSTREET FLOOD WIDTH(FEET) =    5.44
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.81
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.85
  STREET FLOW TRAVEL TIME(MIN.) =   2.14   Tc(MIN.) =  14.88
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.602
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP    (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL GOOD COVER
  "OPEN BRUSH"                D        1.07      0.20      1.000     81
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    1.07      SUBAREA RUNOFF(CFS) =    2.31
  EFFECTIVE AREA(ACRES) =      1.78    AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =        1.8       PEAK FLOW RATE(CFS) =       3.85

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.24   HALFSTREET FLOOD WIDTH(FEET) =   6.43
  FLOW VELOCITY(FEET/SEC.) =  4.07   DEPTH*VELOCITY(FT*FT/SEC.) =   0.98
```

```
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     755.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =         1.8  TC(MIN.) =     14.88
 EFFECTIVE AREA(ACRES) =       1.78  AREA-AVERAGED Fm(INCH/HR)=  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 1.000
 PEAK FLOW RATE(CFS)    =        3.85
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

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

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

 ************************** DESCRIPTION OF STUDY **************************
* Serrano Highlands Hydrology Analysis                                    *
* Existing Condition, Drainage Area "B"                                   *
* 25-year Storm                                                           *
 ************************************************************************

  FILE NAME: SERRANOE.DAT
  TIME/DATE OF STUDY: 10:00 07/22/2011
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

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

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)     SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  =====  ====  =====  =======
  1   14.0       9.0   0.020/0.020/0.020    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      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) =   203.00
  ELEVATION DATA: UPSTREAM(FEET) =    690.00  DOWNSTREAM(FEET) =    650.00
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =  10.837
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.113
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "OPEN BRUSH"                C        0.32      0.25      1.000    75   10.84
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.82
  TOTAL AREA(ACRES) =      0.32   PEAK FLOW RATE(CFS) =      0.82

************************************************************************
  FLOW PROCESS FROM NODE      21.00 TO NODE      22.00 IS CODE =  52
------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    650.00  DOWNSTREAM(FEET) =    572.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   879.00   CHANNEL SLOPE =  0.0887
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.82
  FLOW VELOCITY(FEET/SEC) =   4.47 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   3.28   Tc(MIN.) =  14.12
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =    1082.00 FEET.

************************************************************************
  FLOW PROCESS FROM NODE      22.00 TO NODE      22.00 IS CODE =  81
------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
========================================================================
  MAINLINE Tc(MIN) =  14.12
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.681
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL GOOD COVER
  "OPEN BRUSH"                D        6.00      0.20      1.000    81
  NATURAL GOOD COVER
  "OPEN BRUSH"                C        0.28      0.25      1.000    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =     6.28      SUBAREA RUNOFF(CFS) =    14.01
  EFFECTIVE AREA(ACRES) =      6.60   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =        6.6       PEAK FLOW RATE(CFS) =      14.71
========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =        6.6  TC(MIN.) =     14.12
  EFFECTIVE AREA(ACRES) =      6.60  AREA-AVERAGED Fm(INCH/HR)=  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)    =      14.71
========================================================================
========================================================================
```

END OF RATIONAL METHOD ANALYSIS

C. 100-YEAR STORM

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

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

 ************************* DESCRIPTION OF STUDY *************************
* Hydrology Study for Serrano Highlands, Tract 15594                    *
* Existing Condition, Drainage Area "A"                                 *
* 100-year Storm                                                        *
 ************************************************************************

  FILE NAME: E3.DAT
  TIME/DATE OF STUDY: 07:56 06/16/2011
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

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

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)     SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  =====  ====  =====  =======
  1   14.0       9.0   0.020/0.020/0.020   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      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) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =    695.00  DOWNSTREAM(FEET) =    640.00
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =  12.853
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.602
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "OPEN BRUSH"               D        1.00      0.20      1.000    95   12.85
  NATURAL GOOD COVER
  "OPEN BRUSH"               B        0.23      0.30      1.000    81   12.85
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.22
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      3.75
  TOTAL AREA(ACRES) =      1.23   PEAK FLOW RATE(CFS) =      3.75

************************************************************************
  FLOW PROCESS FROM NODE      31.00 TO NODE      32.00 IS CODE =  52
------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    640.00  DOWNSTREAM(FEET) =    574.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1122.00   CHANNEL SLOPE =  0.0588
  CHANNEL FLOW THRU SUBAREA(CFS) =      3.75
  FLOW VELOCITY(FEET/SEC) =   4.79 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   3.91   Tc(MIN.) =  16.76
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =    1422.00 FEET.

************************************************************************
  FLOW PROCESS FROM NODE      32.00 TO NODE      32.00 IS CODE =  81
------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
========================================================================
  MAINLINE Tc(MIN) =  16.76
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.094
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL GOOD COVER
  "OPEN BRUSH"               D       10.80      0.20      1.000    95
  NATURAL GOOD COVER
  "OPEN BRUSH"               C        3.10      0.25      1.000    91
  NATURAL GOOD COVER
  "OPEN BRUSH"               B        8.50      0.30      1.000    81
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.24
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =  22.40     SUBAREA RUNOFF(CFS) =  57.44
  EFFECTIVE AREA(ACRES) =  23.63   AREA-AVERAGED Fm(INCH/HR) =  0.24
  AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =  23.6      PEAK FLOW RATE(CFS) =  60.62
========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =      23.6  TC(MIN.) =    16.76
  EFFECTIVE AREA(ACRES) =    23.63  AREA-AVERAGED Fm(INCH/HR)=  0.24
  AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap = 1.000
```

PEAK FLOW RATE(CFS) = 60.62

END OF RATIONAL METHOD ANALYSIS

```
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                        Analysis prepared by:

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

 ************************* DESCRIPTION OF STUDY *************************
* Hydrology Study for Serrano Highlands, Tract 15594                    *
* Existing Condition, Drainage Area "B"                                 *
* 100-year Storm                                                        *
 **************************************************************************

  FILE NAME: E2.DAT
  TIME/DATE OF STUDY: 07:59 06/16/2011
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

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

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)     SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  =====  ====  =====  =======
  1   14.0       9.0   0.020/0.020/0.020    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) =  300.00
  ELEVATION DATA: UPSTREAM(FEET) =  611.00  DOWNSTREAM(FEET) =  587.00
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =  15.172
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.275
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "OPEN BRUSH"                D        1.26      0.20      1.000    95   15.17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      3.49
  TOTAL AREA(ACRES) =      1.26   PEAK FLOW RATE(CFS) =      3.49

**************************************************************************
  FLOW PROCESS FROM NODE       2.00 TO NODE       3.00 IS CODE =  52
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    587.00  DOWNSTREAM(FEET) =    579.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   230.00   CHANNEL SLOPE =  0.0348
  CHANNEL FLOW THRU SUBAREA(CFS) =      3.49
  FLOW VELOCITY(FEET/SEC) =   3.62 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.06   Tc(MIN.) =  16.23
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     530.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE       3.00 TO NODE       3.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN) =  16.23
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.151
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL GOOD COVER
  "OPEN BRUSH"                D        1.09      0.20      1.000    95
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =     1.09      SUBAREA RUNOFF(CFS) =     2.90
  EFFECTIVE AREA(ACRES) =      2.35   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       2.3       PEAK FLOW RATE(CFS) =       6.24
==========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =        2.3  TC(MIN.) =     16.23
  EFFECTIVE AREA(ACRES) =      2.35  AREA-AVERAGED Fm(INCH/HR)=  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)    =       6.24
==========================================================================
==========================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

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

 ************************* DESCRIPTION OF STUDY *************************
* Hydrology Study for Serrano Highlands, Tract 15594                    *
* Existing Condition, Drainage Area "B"                                 *
* 100-year Storm                                                        *
 **************************************************************************

  FILE NAME: E1.DAT
  TIME/DATE OF STUDY: 07:57 06/16/2011
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

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

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  =====  ====  =====  =======
  1   14.0       9.0   0.020/0.020/0.020   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      10.00 TO NODE      11.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   266.00
  ELEVATION DATA: UPSTREAM(FEET) =    650.00  DOWNSTREAM(FEET) =    610.00
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =  12.745
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.620
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "OPEN BRUSH"                D        0.71      0.20      1.000     95   12.74
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.19
  TOTAL AREA(ACRES) =      0.71   PEAK FLOW RATE(CFS) =      2.19

**************************************************************************
  FLOW PROCESS FROM NODE      11.00 TO NODE      12.00 IS CODE =  61
--------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
==========================================================================
  UPSTREAM ELEVATION(FEET) =  610.00  DOWNSTREAM ELEVATION(FEET) =  582.00
  STREET LENGTH(FEET) =  489.00  CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 17.60

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  12.60
  INSIDE STREET CROSSFALL(DECIMAL) =  0.017
  OUTSIDE STREET CROSSFALL(DECIMAL) =  0.017

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

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      3.69
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.24
   HALFSTREET FLOOD WIDTH(FEET) =  6.33
   AVERAGE FLOW VELOCITY(FEET/SEC.) =  4.00
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =  0.95
  STREET FLOW TRAVEL TIME(MIN.) =  2.04  Tc(MIN.) =  14.78
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.324
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL GOOD COVER
  "OPEN BRUSH"                D        1.07      0.20      1.000     95
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =  1.07   SUBAREA RUNOFF(CFS) =  3.01
  EFFECTIVE AREA(ACRES) =  1.78   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =  1.8   PEAK FLOW RATE(CFS) =  5.01

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.26  HALFSTREET FLOOD WIDTH(FEET) =  7.41
  FLOW VELOCITY(FEET/SEC.) =  4.25  DEPTH*VELOCITY(FT*FT/SEC.) =  1.09
```

```
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     755.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =         1.8  TC(MIN.) =     14.78
 EFFECTIVE AREA(ACRES) =       1.78  AREA-AVERAGED Fm(INCH/HR)=  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 1.000
 PEAK FLOW RATE(CFS)    =        5.01
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

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

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

 ************************* DESCRIPTION OF STUDY *************************
* Serrano Highlands Hydrology Analysis                                  *
* Existing Condition, Drainage Area "B"                                 *
* 100-year Storm                                                        *
 ************************************************************************

  FILE NAME: SERRANOE.DAT
  TIME/DATE OF STUDY: 08:34 07/21/2011
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

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

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)     SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  =====  ====  =====  =======
  1   14.0       9.0   0.020/0.020/0.020    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      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) =  203.00
  ELEVATION DATA: UPSTREAM(FEET) =    690.00  DOWNSTREAM(FEET) =    650.00
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =  10.837
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.972
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "OPEN BRUSH"                C        0.32      0.25      1.000    91   10.84
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      1.07
  TOTAL AREA(ACRES) =      0.32   PEAK FLOW RATE(CFS) =      1.07

**************************************************************************
  FLOW PROCESS FROM NODE      21.00 TO NODE      22.00 IS CODE =  52
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    650.00  DOWNSTREAM(FEET) =    572.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   879.00   CHANNEL SLOPE =  0.0887
  CHANNEL FLOW THRU SUBAREA(CFS) =      1.07
  FLOW VELOCITY(FEET/SEC) =   4.53 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   3.24   Tc(MIN.) =  14.07
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =    1082.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE      22.00 TO NODE      22.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN) =  14.07
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.420
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL GOOD COVER
  "OPEN BRUSH"                D        6.00      0.20      1.000    95
  NATURAL GOOD COVER
  "OPEN BRUSH"                C        0.28      0.25      1.000    91
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =     6.28      SUBAREA RUNOFF(CFS) =   18.19
  EFFECTIVE AREA(ACRES) =      6.60   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =        6.6       PEAK FLOW RATE(CFS) =      19.10
==========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =        6.6  TC(MIN.) =     14.07
  EFFECTIVE AREA(ACRES) =      6.60  AREA-AVERAGED Fm(INCH/HR)=  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)    =      19.10
==========================================================================
==========================================================================
  END OF RATIONAL METHOD ANALYSIS
```
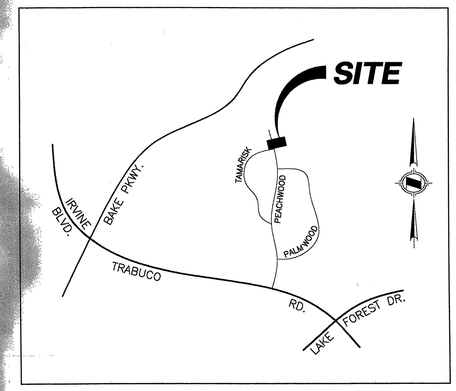

VICINITY MAP



LEGEND

- MAJOR DRAINAGE BOUNDARY
- MINOR DRAINAGE BOUNDARY
- 25 — NODE NUMBER
- A / 1.23 — AREA DESIGNATION / AREA ACREAGE (IN ACRES)
- ΣQ25 =2.4cfs / t=12.9 — PEAK CONFLUENCE FLOW RATE / TIME OF CONCENTRATION
- FLOW LINE
- EXISTING STORM DRAIN
- SOIL GROUP

PREPARED BY:

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EXISTING HYDROLOGY MAP

TT# 15594

JUL 22 2011

F:\0319\Engineering\SY-Hydrology\Existing Hydrology.dwg

AUG 09 2011

WP: 0045-AV TTM # 15594

SECTION 3

PROPOSED CONDITION
HYDROLOGY CALCULATIONS AND MAP

A. 10-YEAR STORM

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

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

 ************************* DESCRIPTION OF STUDY *************************
* Hydrology Study for Serrano Highlands, Tract 15594                    *
* Proposed Condition, Drainage Area "A"                                 *
* 10-year Storm                                                         *
 ************************************************************************

  FILE NAME: SH_A.DAT
  TIME/DATE OF STUDY: 10:08 07/22/2011
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)     SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  =====  ====  =====  =======
  1   14.0       9.0   0.020/0.020/0.020    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      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) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =     695.00  DOWNSTREAM(FEET) =     640.00
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.853
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.363
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "OPEN BRUSH"               D        1.00      0.20       1.000   81   12.85
  NATURAL GOOD COVER
  "OPEN BRUSH"               B        0.23      0.30       1.000   63   12.85
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.22
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.37
  TOTAL AREA(ACRES) =      1.23   PEAK FLOW RATE(CFS) =      2.37

**************************************************************************
  FLOW PROCESS FROM NODE      21.00 TO NODE      22.00 IS CODE =  52
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     640.00  DOWNSTREAM(FEET) =     608.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   472.00   CHANNEL SLOPE =  0.0678
  CHANNEL FLOW THRU SUBAREA(CFS) =      2.37
  FLOW VELOCITY(FEET/SEC) =   4.65 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.69   Tc(MIN.) =  14.55
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =     772.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE      22.00 TO NODE      22.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN) =  14.55
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.202
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL GOOD COVER
  "OPEN BRUSH"               B        2.72      0.30       1.000   63
  NATURAL GOOD COVER
  "OPEN BRUSH"               C        0.87      0.25       1.000   75
  NATURAL GOOD COVER
  "OPEN BRUSH"               D        2.70      0.20       1.000   81
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =     6.29     SUBAREA RUNOFF(CFS) =    11.05
  EFFECTIVE AREA(ACRES) =     7.52   AREA-AVERAGED Fm(INCH/HR) =  0.25
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       7.5      PEAK FLOW RATE(CFS) =     13.24

**************************************************************************
  FLOW PROCESS FROM NODE      22.00 TO NODE      23.00 IS CODE =  31
--------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   608.00  DOWNSTREAM(FEET) =   607.00
 FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.10
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      13.24
 PIPE TRAVEL TIME(MIN.) =   0.44    Tc(MIN.) =  14.98
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     23.00 =     932.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     23.00 TO NODE     23.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  14.98
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.165
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "OPEN BRUSH"                C        0.76      0.25      1.000    75
 NATURAL GOOD COVER
 "OPEN BRUSH"                D        1.35      0.20      1.000    81
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.22
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =     2.11      SUBAREA RUNOFF(CFS) =     3.70
 EFFECTIVE AREA(ACRES) =      9.63   AREA-AVERAGED Fm(INCH/HR) =  0.24
 AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =       9.6       PEAK FLOW RATE(CFS) =      16.69

****************************************************************************
 FLOW PROCESS FROM NODE     23.00 TO NODE     24.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   607.00  DOWNSTREAM(FEET) =   598.50
 FLOW LENGTH(FEET) =   315.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  14.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  10.85
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      16.69
 PIPE TRAVEL TIME(MIN.) =   0.48    Tc(MIN.) =  15.47
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     24.00 =    1247.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     24.00 TO NODE     24.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  15.47
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.125
 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        1.22      0.20      0.400    75
 NATURAL GOOD COVER
 "OPEN BRUSH"                D        0.30      0.20      1.000    81
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.518
 SUBAREA AREA(ACRES) =     1.52      SUBAREA RUNOFF(CFS) =     2.77
 EFFECTIVE AREA(ACRES) =     11.15   AREA-AVERAGED Fm(INCH/HR) =  0.22
 AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  0.93
 TOTAL AREA(ACRES) =       11.1       PEAK FLOW RATE(CFS) =      19.11

****************************************************************************
 FLOW PROCESS FROM NODE     24.00 TO NODE     24.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  15.47
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.125
 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"       B        0.16      0.30      0.400    56
 COMMERCIAL                  D        0.16      0.20      0.100    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.28
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.250
 SUBAREA AREA(ACRES) =     0.32      SUBAREA RUNOFF(CFS) =     0.59
 EFFECTIVE AREA(ACRES) =     11.47   AREA-AVERAGED Fm(INCH/HR) =  0.22
 AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  0.92
 TOTAL AREA(ACRES) =       11.5       PEAK FLOW RATE(CFS) =      19.71

****************************************************************************
 FLOW PROCESS FROM NODE     24.00 TO NODE     31.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   598.50  DOWNSTREAM(FEET) =   598.00
 FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.94
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      19.71
 PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =  15.57
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     31.00 =    1297.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     31.00 TO NODE     31.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =  15.57
 RAINFALL INTENSITY(INCH/HR) =   2.12
```

```
 AREA-AVERAGED Fm(INCH/HR) =  0.22
 AREA-AVERAGED Fp(INCH/HR) =  0.24
 AREA-AVERAGED Ap =  0.92
 EFFECTIVE STREAM AREA(ACRES) =      11.47
 TOTAL STREAM AREA(ACRES) =      11.47
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      19.71

****************************************************************************
 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) =   230.00
 ELEVATION DATA: UPSTREAM(FEET) =    687.00  DOWNSTREAM(FEET) =    645.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.566
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.511
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL GOOD COVER
 "OPEN BRUSH"                C        0.44      0.25      1.000    75   11.57
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      0.90
 TOTAL AREA(ACRES) =      0.44   PEAK FLOW RATE(CFS) =      0.90

****************************************************************************
 FLOW PROCESS FROM NODE     27.00 TO NODE     28.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    645.00  DOWNSTREAM(FEET) =    620.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   170.00   CHANNEL SLOPE =  0.1471
 NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
 NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
 CHANNEL FLOW THRU SUBAREA(CFS) =       0.90
 FLOW VELOCITY(FEET/SEC) =   4.74 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   0.60   Tc(MIN.) =  12.16
 LONGEST FLOWPATH FROM NODE     26.00 TO NODE     28.00 =     400.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     28.00 TO NODE     28.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  12.16
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.439
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "OPEN BRUSH"                C        0.59      0.25      1.000    75
 NATURAL GOOD COVER
 "OPEN BRUSH"                D        0.66      0.20      1.000    81
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.22
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =      1.25      SUBAREA RUNOFF(CFS) =      2.49
 EFFECTIVE AREA(ACRES) =      1.69   AREA-AVERAGED Fm(INCH/HR) =  0.23
 AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =      1.7       PEAK FLOW RATE(CFS) =      3.36

****************************************************************************
 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) =   620.00  DOWNSTREAM(FEET) =   610.00
 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.) =  13.79
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      3.36
 PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =  12.24
 LONGEST FLOWPATH FROM NODE     26.00 TO NODE     29.00 =     465.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     29.00 TO NODE     29.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  12.24
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.430
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "OPEN BRUSH"                C        0.21      0.25      1.000    75
 NATURAL GOOD COVER
 "OPEN BRUSH"                D        0.74      0.20      1.000    81
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.21
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =      0.95      SUBAREA RUNOFF(CFS) =      1.90
 EFFECTIVE AREA(ACRES) =      2.64   AREA-AVERAGED Fm(INCH/HR) =  0.22
 AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =      2.6       PEAK FLOW RATE(CFS) =      5.24

****************************************************************************
 FLOW PROCESS FROM NODE     29.00 TO NODE     30.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   610.00  DOWNSTREAM(FEET) =   602.00
 FLOW LENGTH(FEET) =   155.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.8 INCHES
```

```
 PIPE-FLOW VELOCITY(FEET/SEC.) =  10.63
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       5.24
 PIPE TRAVEL TIME(MIN.) =   0.24    Tc(MIN.) =  12.49
 LONGEST FLOWPATH FROM NODE     26.00 TO NODE     30.00 =     620.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     30.00 TO NODE     30.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  12.49
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.403
 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        0.66      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) =     0.66     SUBAREA RUNOFF(CFS) =     1.38
 EFFECTIVE AREA(ACRES) =      3.30   AREA-AVERAGED Fm(INCH/HR) =  0.19
 AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  0.88
 TOTAL AREA(ACRES) =       3.3      PEAK FLOW RATE(CFS) =       6.56

****************************************************************************
 FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   602.00  DOWNSTREAM(FEET) =   598.00
 FLOW LENGTH(FEET) =    25.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  16.99
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       6.56
 PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =  12.51
 LONGEST FLOWPATH FROM NODE     26.00 TO NODE     31.00 =     645.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     31.00 TO NODE     31.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =  12.51
 RAINFALL INTENSITY(INCH/HR) =   2.40
 AREA-AVERAGED Fm(INCH/HR) =  0.19
 AREA-AVERAGED Fp(INCH/HR) =  0.22
 AREA-AVERAGED Ap =  0.88
 EFFECTIVE STREAM AREA(ACRES) =       3.30
 TOTAL STREAM AREA(ACRES) =       3.30
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.56

 ** CONFLUENCE DATA **
  STREAM       Q      Tc    Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)  (MIN.)  (INCH/HR)  (INCH/HR)            (ACRES)    NODE
     1       19.71  15.57     2.117   0.24( 0.22) 0.92       11.5       20.00
     2        6.56  12.51     2.400   0.22( 0.19) 0.88        3.3       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       24.75  12.51     2.400   0.23( 0.21) 0.91       12.5       26.00
     2       25.42  15.57     2.117   0.23( 0.21) 0.91       14.8       20.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      25.42    Tc(MIN.) =    15.57
 EFFECTIVE AREA(ACRES) =      14.77   AREA-AVERAGED Fm(INCH/HR) =  0.21
 AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap =  0.91
 TOTAL AREA(ACRES) =       14.8
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     31.00 =    1297.00 FEET.

****************************************************************************
 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) =   598.00  DOWNSTREAM(FEET) =   595.50
 FLOW LENGTH(FEET) =   111.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  11.61
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      25.42
 PIPE TRAVEL TIME(MIN.) =   0.16    Tc(MIN.) =  15.73
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     32.00 =    1408.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     32.00 TO NODE     32.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  15.73
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.105
 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"       B        0.89      0.30      0.400    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
 SUBAREA AREA(ACRES) =     0.89     SUBAREA RUNOFF(CFS) =     1.59
 EFFECTIVE AREA(ACRES) =     15.66   AREA-AVERAGED Fm(INCH/HR) =  0.21
 AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap =  0.88
```

```
 TOTAL AREA(ACRES) =      15.7      PEAK FLOW RATE(CFS) =      26.76

****************************************************************************
 FLOW PROCESS FROM NODE     32.00 TO NODE     33.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   595.50  DOWNSTREAM(FEET) =   594.50
 FLOW LENGTH(FEET) =    35.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.91
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      26.76
 PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =  15.78
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     33.00 =    1443.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     33.00 TO NODE     33.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  15.78
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.101
 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"       B        1.35      0.30      0.400    56
 RESIDENTIAL
 "8-10 DWELLINGS/ACRE"       D        0.62      0.20      0.400    75
 NATURAL GOOD COVER
 "OPEN BRUSH"                D        0.20      0.20      1.000    81
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.455
 SUBAREA AREA(ACRES) =     2.17     SUBAREA RUNOFF(CFS) =     3.88
 EFFECTIVE AREA(ACRES) =     17.83   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  0.83
 TOTAL AREA(ACRES) =      17.8      PEAK FLOW RATE(CFS) =      30.59

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
     1       30.64  12.72    2.378  0.24( 0.19) 0.81       15.6       26.00
     2       30.59  15.78    2.101  0.24( 0.20) 0.83       17.8       20.00
 NEW PEAK FLOW DATA ARE:
 PEAK FLOW RATE(CFS) =      30.64  Tc(MIN.) =  12.72
 AREA-AVERAGED Fm(INCH/HR) =  0.19  AREA-AVERAGED Fp(INCH/HR) =  0.24
 AREA-AVERAGED Ap =  0.81  EFFECTIVE AREA(ACRES) =      15.57

****************************************************************************
 FLOW PROCESS FROM NODE     33.00 TO NODE     34.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   594.00  DOWNSTREAM(FEET) =   590.50
 FLOW LENGTH(FEET) =   145.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.33
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      30.64
 PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =  12.91
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     34.00 =    1588.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     34.00 TO NODE     34.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  12.91
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.357
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "OPEN BRUSH"                C        1.68      0.25      1.000    75
 NATURAL GOOD COVER
 "OPEN BRUSH"                D        1.00      0.20      1.000    81
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.23
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =     2.68     SUBAREA RUNOFF(CFS) =     5.13
 EFFECTIVE AREA(ACRES) =     18.25   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  0.84
 TOTAL AREA(ACRES) =      20.5      PEAK FLOW RATE(CFS) =      35.47

****************************************************************************
 FLOW PROCESS FROM NODE     34.00 TO NODE     35.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   590.50  DOWNSTREAM(FEET) =   581.00
 FLOW LENGTH(FEET) =   130.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  19.48
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      35.47
 PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =  13.02
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     35.00 =    1718.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     35.00 TO NODE     35.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  13.02
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.346
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
```

```
"OPEN BRUSH"                B        0.26      0.30     1.000    63
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
SUBAREA AREA(ACRES) =     0.26      SUBAREA RUNOFF(CFS) =     0.48
EFFECTIVE AREA(ACRES) =     18.51   AREA-AVERAGED Fm(INCH/HR) =  0.20
AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  0.84
TOTAL AREA(ACRES) =       20.8       PEAK FLOW RATE(CFS) =      35.76

****************************************************************************
FLOW PROCESS FROM NODE     35.00 TO NODE     36.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   581.00  DOWNSTREAM(FEET) =   571.00
FLOW LENGTH(FEET) =   115.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =  20.96
ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =      35.76
PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =  13.11
LONGEST FLOWPATH FROM NODE     20.00 TO NODE     36.00 =    1833.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     36.00 TO NODE     36.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
MAINLINE Tc(MIN) =  13.11
*  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.336
SUBAREA LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
NATURAL GOOD COVER
"OPEN BRUSH"                B        0.76      0.30     1.000    63
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
SUBAREA AREA(ACRES) =     0.76      SUBAREA RUNOFF(CFS) =     1.39
EFFECTIVE AREA(ACRES) =     19.27   AREA-AVERAGED Fm(INCH/HR) =  0.20
AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  0.85
TOTAL AREA(ACRES) =       21.5       PEAK FLOW RATE(CFS) =      37.00
============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)      =       21.5  TC(MIN.) =     13.11
EFFECTIVE AREA(ACRES) =     19.27  AREA-AVERAGED Fm(INCH/HR)=  0.20
AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap = 0.850
PEAK FLOW RATE(CFS)    =      37.00

** PEAK FLOW RATE TABLE **
 STREAM       Q     Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
 NUMBER     (CFS) (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
    1       37.00  13.11    2.336  0.24( 0.20) 0.85      19.3       26.00
    2       36.17  16.18    2.072  0.24( 0.20) 0.86      21.5       20.00
============================================================================
============================================================================
END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
        (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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 ************************* DESCRIPTION OF STUDY *************************
* Hydrology Study for Serrano Highlands, Tract 15594                    *
* Proposed Condition, Drainage "B"                                      *
* 10-year Storm                                                         *
 ************************************************************************

  FILE NAME: SH_B.DAT
  TIME/DATE OF STUDY: 08:06 07/21/2011
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  =====  ====  =====  =======
  1   14.0       9.0   0.020/0.020/0.020    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) =   203.00
  ELEVATION DATA: UPSTREAM(FEET) =    690.00  DOWNSTREAM(FEET) =    650.00
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =  10.837
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.606
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "OPEN BRUSH"                C        0.32      0.25      1.000    75   10.84
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.68
  TOTAL AREA(ACRES) =      0.32   PEAK FLOW RATE(CFS) =      0.68

**************************************************************************
  FLOW PROCESS FROM NODE       2.00 TO NODE       3.00 IS CODE =  52
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    650.00  DOWNSTREAM(FEET) =    615.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   230.00   CHANNEL SLOPE =  0.1522
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.68
  FLOW VELOCITY(FEET/SEC) =   4.74 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.81   Tc(MIN.) =  11.64
  LONGEST FLOWPATH FROM NODE       1.00 TO NODE       3.00 =     433.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE       3.00 TO NODE       3.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN) =  11.64
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.501
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL GOOD COVER
  "OPEN BRUSH"                D        1.00      0.20      1.000    81
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =     1.00     SUBAREA RUNOFF(CFS) =     2.07
  EFFECTIVE AREA(ACRES) =      1.32   AREA-AVERAGED Fm(INCH/HR) =  0.21
  AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       1.3      PEAK FLOW RATE(CFS) =       2.72

**************************************************************************
  FLOW PROCESS FROM NODE       3.00 TO NODE       4.00 IS CODE =  31
--------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    615.00  DOWNSTREAM(FEET) =    308.00
  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   1.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  42.98
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       2.72
 PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =  11.67
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =     498.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  11.67
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.498
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "OPEN BRUSH"                D        0.37      0.20      1.000    81
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =     0.37      SUBAREA RUNOFF(CFS) =     0.77
 EFFECTIVE AREA(ACRES) =      1.69   AREA-AVERAGED Fm(INCH/HR) =  0.21
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =        1.7       PEAK FLOW RATE(CFS) =       3.48

****************************************************************************
 FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   608.00  DOWNSTREAM(FEET) =   605.50
 FLOW LENGTH(FEET) =   100.00   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.) =   7.29
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       3.48
 PIPE TRAVEL TIME(MIN.) =   0.23    Tc(MIN.) =  11.90
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =     598.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      5.00 TO NODE      5.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  11.90
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.470
 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"       C        0.28      0.25      0.400    69
 RESIDENTIAL
 "8-10 DWELLINGS/ACRE"       D        1.20      0.20      0.400    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.21
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
 SUBAREA AREA(ACRES) =     1.48      SUBAREA RUNOFF(CFS) =     3.18
 EFFECTIVE AREA(ACRES) =      3.17   AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.72
 TOTAL AREA(ACRES) =        3.2       PEAK FLOW RATE(CFS) =       6.62

****************************************************************************
 FLOW PROCESS FROM NODE      5.00 TO NODE      5.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  11.90
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.470
 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        1.13      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) =     1.13      SUBAREA RUNOFF(CFS) =     2.43
 EFFECTIVE AREA(ACRES) =      4.30   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.64
 TOTAL AREA(ACRES) =        4.3       PEAK FLOW RATE(CFS) =       9.05

****************************************************************************
 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) =   605.50  DOWNSTREAM(FEET) =   605.00
 FLOW LENGTH(FEET) =    60.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  14.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.02
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       9.05
 PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =  12.06
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 =     658.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      6.00 TO NODE      6.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  12.06
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.451
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "OPEN BRUSH"                C        0.36      0.25      1.000    75
 NATURAL GOOD COVER
 "OPEN BRUSH"                D        0.16      0.20      1.000    81
```

```
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.23
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =     0.52      SUBAREA RUNOFF(CFS) =     1.04
 EFFECTIVE AREA(ACRES) =      4.82   AREA-AVERAGED Fm(INCH/HR) =  0.14
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.68
 TOTAL AREA(ACRES) =        4.8       PEAK FLOW RATE(CFS) =      10.01

****************************************************************************
 FLOW PROCESS FROM NODE      6.00 TO NODE      7.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   605.00  DOWNSTREAM(FEET) =   591.00
 FLOW LENGTH(FEET) =   415.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   9.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  10.81
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      10.01
 PIPE TRAVEL TIME(MIN.) =   0.64    Tc(MIN.) =  12.70
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =    1073.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  12.70
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.379
 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"       B        0.16      0.30      0.400    56
 RESIDENTIAL
 "8-10 DWELLINGS/ACRE"       C        0.66      0.25      0.400    69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.26
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
 SUBAREA AREA(ACRES) =     0.82      SUBAREA RUNOFF(CFS) =     1.68
 EFFECTIVE AREA(ACRES) =      5.64   AREA-AVERAGED Fm(INCH/HR) =  0.14
 AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  0.64
 TOTAL AREA(ACRES) =        5.6       PEAK FLOW RATE(CFS) =      11.38

****************************************************************************
 FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  12.70
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.379
 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"       B        0.69      0.30      0.400    56
 RESIDENTIAL
 "8-10 DWELLINGS/ACRE"       C        0.50      0.25      0.400    69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.28
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
 SUBAREA AREA(ACRES) =     1.19      SUBAREA RUNOFF(CFS) =     2.43
 EFFECTIVE AREA(ACRES) =      6.83   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  0.59
 TOTAL AREA(ACRES) =        6.8       PEAK FLOW RATE(CFS) =      13.81

****************************************************************************
 FLOW PROCESS FROM NODE      7.00 TO NODE      8.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   591.00  DOWNSTREAM(FEET) =   580.50
 FLOW LENGTH(FEET) =   340.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  11.22
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      13.81
 PIPE TRAVEL TIME(MIN.) =   0.50    Tc(MIN.) =  13.21
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      8.00 =    1413.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      8.00 TO NODE      8.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  13.21
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.327
 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        0.92      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) =     0.92      SUBAREA RUNOFF(CFS) =     1.86
 EFFECTIVE AREA(ACRES) =      7.75   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  0.57
 TOTAL AREA(ACRES) =        7.8       PEAK FLOW RATE(CFS) =      15.34

****************************************************************************
 FLOW PROCESS FROM NODE      8.00 TO NODE      8.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  13.21
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.327
 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        0.77      0.20      0.400    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
```

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 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
 SUBAREA AREA(ACRES) =     0.77      SUBAREA RUNOFF(CFS) =     1.56
 EFFECTIVE AREA(ACRES) =      8.52   AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  0.56
 TOTAL AREA(ACRES) =        8.5       PEAK FLOW RATE(CFS) =      16.90

****************************************************************************
 FLOW PROCESS FROM NODE      8.00 TO NODE     15.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   580.50  DOWNSTREAM(FEET) =   580.00
 FLOW LENGTH(FEET) =    55.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  16.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.44
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      16.90
 PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =  13.33
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE     15.00 =    1468.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =  13.33
 RAINFALL INTENSITY(INCH/HR) =   2.31
 AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.22
 AREA-AVERAGED Ap =  0.56
 EFFECTIVE STREAM AREA(ACRES) =       8.52
 TOTAL STREAM AREA(ACRES) =       8.52
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      16.90

****************************************************************************
 FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   266.00
 ELEVATION DATA: UPSTREAM(FEET) =    650.00  DOWNSTREAM(FEET) =    610.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.745
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.375
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL GOOD COVER
 "OPEN BRUSH"                D        0.75      0.20      1.000    81   12.74
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      1.47
 TOTAL AREA(ACRES) =      0.75   PEAK FLOW RATE(CFS) =      1.47

****************************************************************************
 FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  61
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  610.00  DOWNSTREAM ELEVATION(FEET) =  584.00
 STREET LENGTH(FEET) =   345.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 17.60

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  12.60
 INSIDE STREET CROSSFALL(DECIMAL) =  0.017
 OUTSIDE STREET CROSSFALL(DECIMAL) =  0.017

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

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.71
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.23
   HALFSTREET FLOOD WIDTH(FEET) =    5.84
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.52
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.04
 STREET FLOW TRAVEL TIME(MIN.) =   1.27   Tc(MIN.) =  14.02
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.249
 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        2.30      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) =     2.30      SUBAREA RUNOFF(CFS) =     4.49
 EFFECTIVE AREA(ACRES) =      3.05    AREA-AVERAGED Fm(INCH/HR) =  0.11
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.55
 TOTAL AREA(ACRES) =        3.0       PEAK FLOW RATE(CFS) =       5.87

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.26   HALFSTREET FLOOD WIDTH(FEET) =   7.51
 FLOW VELOCITY(FEET/SEC.) =  4.89   DEPTH*VELOCITY(FT*FT/SEC.) =   1.26
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     611.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   584.00  DOWNSTREAM(FEET) =   583.00
 FLOW LENGTH(FEET) =    25.00   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.) =  10.00
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =        5.87
 PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =  14.06
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     13.00 =     636.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     13.00 TO NODE     13.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  14.06
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.245
 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        0.77      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) =     0.77      SUBAREA RUNOFF(CFS) =     1.50
 EFFECTIVE AREA(ACRES) =      3.82   AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.52
 TOTAL AREA(ACRES) =        3.8       PEAK FLOW RATE(CFS) =       7.36

****************************************************************************
 FLOW PROCESS FROM NODE     13.00 TO NODE     15.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   583.00  DOWNSTREAM(FEET) =   580.00
 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   7.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  11.21
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =        7.36
 PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =  14.16
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     15.00 =     701.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 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.) =  14.16
 RAINFALL INTENSITY(INCH/HR) =   2.24
 AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.52
 EFFECTIVE STREAM AREA(ACRES) =       3.82
 TOTAL STREAM AREA(ACRES) =       3.82
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       7.36

 ** CONFLUENCE DATA **
  STREAM       Q     Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS) (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
     1       16.90  13.33    2.314  0.22( 0.12) 0.56       8.5       1.00
     2        7.36  14.16    2.236  0.20( 0.10) 0.52       3.8      10.00

 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       24.09  13.33    2.314  0.21( 0.12) 0.54      12.1       1.00
     2       23.66  14.16    2.236  0.21( 0.12) 0.54      12.3      10.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      24.09    Tc(MIN.) =    13.33
 EFFECTIVE AREA(ACRES) =      12.12   AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.54
 TOTAL AREA(ACRES) =       12.3
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE     15.00 =    1468.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =       12.3  TC(MIN.) =     13.33
 EFFECTIVE AREA(ACRES) =     12.12  AREA-AVERAGED Fm(INCH/HR)=  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap = 0.544
 PEAK FLOW RATE(CFS)    =      24.09

 ** PEAK FLOW RATE TABLE **
  STREAM       Q     Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS) (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
     1       24.09  13.33    2.314  0.21( 0.12) 0.54      12.1       1.00
     2       23.66  14.16    2.236  0.21( 0.12) 0.54      12.3      10.00
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

B. 25-YEAR STORM

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

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 ************************* DESCRIPTION OF STUDY *************************
* Hydrology Study for Serrano Highlands, Tract 15594                    *
* Proposed Condition, Drainage Area "A"                                 *
* 25-year Storm                                                         *
 ************************************************************************

  FILE NAME: SH_A.DAT
  TIME/DATE OF STUDY: 17:59 07/18/2011
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

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

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)     SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  =====  ====  =====  =======
  1   14.0       9.0   0.020/0.020/0.020    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      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) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =     695.00  DOWNSTREAM(FEET) =     640.00
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.853
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.827
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "OPEN BRUSH"               D        1.00      0.20       1.000   81   12.85
  NATURAL GOOD COVER
  "OPEN BRUSH"               B        0.23      0.30       1.000   63   12.85
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.22
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.89
  TOTAL AREA(ACRES) =      1.23   PEAK FLOW RATE(CFS) =      2.89

**************************************************************************
  FLOW PROCESS FROM NODE      21.00 TO NODE      22.00 IS CODE =  52
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     640.00  DOWNSTREAM(FEET) =     608.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   472.00   CHANNEL SLOPE =  0.0678
  CHANNEL FLOW THRU SUBAREA(CFS) =      2.89
  FLOW VELOCITY(FEET/SEC) =   4.85 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.62   Tc(MIN.) =  14.48
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =     772.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE      22.00 TO NODE      22.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN) =  14.48
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.643
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL GOOD COVER
  "OPEN BRUSH"               B        2.72      0.30       1.000   63
  NATURAL GOOD COVER
  "OPEN BRUSH"               C        0.87      0.25       1.000   75
  NATURAL GOOD COVER
  "OPEN BRUSH"               D        2.70      0.20       1.000   81
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =     6.29     SUBAREA RUNOFF(CFS) =    13.55
  EFFECTIVE AREA(ACRES) =     7.52   AREA-AVERAGED Fm(INCH/HR) =  0.25
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       7.5      PEAK FLOW RATE(CFS) =     16.23

**************************************************************************
  FLOW PROCESS FROM NODE      22.00 TO NODE      23.00 IS CODE =  31
--------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   608.00  DOWNSTREAM(FEET) =   607.00
 FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  18.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.30
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      16.23
 PIPE TRAVEL TIME(MIN.) =   0.42    Tc(MIN.) =  14.90
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     23.00 =     932.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     23.00 TO NODE     23.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
 MAINLINE Tc(MIN) =  14.90
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.600
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "OPEN BRUSH"                C        0.76      0.25      1.000    75
 NATURAL GOOD COVER
 "OPEN BRUSH"                D        1.35      0.20      1.000    81
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.22
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =     2.11     SUBAREA RUNOFF(CFS) =     4.52
 EFFECTIVE AREA(ACRES) =      9.63   AREA-AVERAGED Fm(INCH/HR) =  0.24
 AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =       9.6       PEAK FLOW RATE(CFS) =      20.46

****************************************************************************
 FLOW PROCESS FROM NODE     23.00 TO NODE     24.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   607.00  DOWNSTREAM(FEET) =   598.50
 FLOW LENGTH(FEET) =   315.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  11.74
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      20.46
 PIPE TRAVEL TIME(MIN.) =   0.45    Tc(MIN.) =  15.35
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     24.00 =    1247.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     24.00 TO NODE     24.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
 MAINLINE Tc(MIN) =  15.35
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.557
 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        1.22      0.20      0.400    75
 NATURAL GOOD COVER
 "OPEN BRUSH"                D        0.30      0.20      1.000    81
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.518
 SUBAREA AREA(ACRES) =     1.52     SUBAREA RUNOFF(CFS) =     3.36
 EFFECTIVE AREA(ACRES) =     11.15   AREA-AVERAGED Fm(INCH/HR) =  0.22
 AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  0.93
 TOTAL AREA(ACRES) =       11.1       PEAK FLOW RATE(CFS) =      23.45

****************************************************************************
 FLOW PROCESS FROM NODE     24.00 TO NODE     24.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
 MAINLINE Tc(MIN) =  15.35
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.557
 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"       B        0.16      0.30      0.400    56
 COMMERCIAL                  D        0.16      0.20      0.100    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.28
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.250
 SUBAREA AREA(ACRES) =     0.32     SUBAREA RUNOFF(CFS) =     0.72
 EFFECTIVE AREA(ACRES) =     11.47   AREA-AVERAGED Fm(INCH/HR) =  0.22
 AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  0.92
 TOTAL AREA(ACRES) =       11.5       PEAK FLOW RATE(CFS) =      24.16

****************************************************************************
 FLOW PROCESS FROM NODE     24.00 TO NODE     31.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   598.50  DOWNSTREAM(FEET) =   598.00
 FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   8.44
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      24.16
 PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =  15.44
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     31.00 =    1297.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     31.00 TO NODE     31.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==========================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =  15.44
 RAINFALL INTENSITY(INCH/HR) =   2.55
```

```
 AREA-AVERAGED Fm(INCH/HR) =  0.22
 AREA-AVERAGED Fp(INCH/HR) =  0.24
 AREA-AVERAGED Ap =  0.92
 EFFECTIVE STREAM AREA(ACRES) =      11.47
 TOTAL STREAM AREA(ACRES) =      11.47
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      24.16

****************************************************************************
 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) =   230.00
 ELEVATION DATA: UPSTREAM(FEET) =    687.00  DOWNSTREAM(FEET) =    645.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.566
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.001
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL GOOD COVER
 "OPEN BRUSH"                C       0.44      0.25      1.000    75   11.57
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      1.09
 TOTAL AREA(ACRES) =      0.44   PEAK FLOW RATE(CFS) =      1.09

****************************************************************************
 FLOW PROCESS FROM NODE     27.00 TO NODE     28.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    645.00  DOWNSTREAM(FEET) =    620.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   170.00   CHANNEL SLOPE =  0.1471
 NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
 CHANNEL FLOW THRU SUBAREA(CFS) =       1.09
 FLOW VELOCITY(FEET/SEC) =   4.82 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   0.59   Tc(MIN.) =  12.15
 LONGEST FLOWPATH FROM NODE     26.00 TO NODE     28.00 =     400.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     28.00 TO NODE     28.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  12.15
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.918
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "OPEN BRUSH"                C       0.59      0.25      1.000    75
 NATURAL GOOD COVER
 "OPEN BRUSH"                D       0.66      0.20      1.000    81
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.22
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =   1.25   SUBAREA RUNOFF(CFS) =    3.03
 EFFECTIVE AREA(ACRES) =    1.69   AREA-AVERAGED Fm(INCH/HR) =  0.23
 AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =     1.7    PEAK FLOW RATE(CFS) =      4.09

****************************************************************************
 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) =   620.00  DOWNSTREAM(FEET) =   610.00
 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   3.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  14.61
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      4.09
 PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =  12.23
 LONGEST FLOWPATH FROM NODE     26.00 TO NODE     29.00 =     465.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     29.00 TO NODE     29.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  12.23
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.908
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "OPEN BRUSH"                C       0.21      0.25      1.000    75
 NATURAL GOOD COVER
 "OPEN BRUSH"                D       0.74      0.20      1.000    81
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.21
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =   0.95   SUBAREA RUNOFF(CFS) =    2.31
 EFFECTIVE AREA(ACRES) =    2.64   AREA-AVERAGED Fm(INCH/HR) =  0.22
 AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =     2.6    PEAK FLOW RATE(CFS) =      6.38

****************************************************************************
 FLOW PROCESS FROM NODE     29.00 TO NODE     30.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   610.00  DOWNSTREAM(FEET) =   602.00
 FLOW LENGTH(FEET) =   155.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  11.23
```

```
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =        6.38
 PIPE TRAVEL TIME(MIN.) =   0.23    Tc(MIN.) =  12.46
 LONGEST FLOWPATH FROM NODE     26.00 TO NODE     30.00 =     620.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     30.00 TO NODE     30.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  12.46
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.877
 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        0.66      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) =     0.66     SUBAREA RUNOFF(CFS) =     1.66
 EFFECTIVE AREA(ACRES) =      3.30   AREA-AVERAGED Fm(INCH/HR) =  0.19
 AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  0.88
 TOTAL AREA(ACRES) =      3.3      PEAK FLOW RATE(CFS) =      7.97

****************************************************************************
 FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   602.00  DOWNSTREAM(FEET) =   598.00
 FLOW LENGTH(FEET) =    25.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  17.95
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =        7.97
 PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =  12.48
 LONGEST FLOWPATH FROM NODE     26.00 TO NODE     31.00 =     645.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     31.00 TO NODE     31.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =  12.48
 RAINFALL INTENSITY(INCH/HR) =   2.87
 AREA-AVERAGED Fm(INCH/HR) =  0.19
 AREA-AVERAGED Fp(INCH/HR) =  0.22
 AREA-AVERAGED Ap =  0.88
 EFFECTIVE STREAM AREA(ACRES) =       3.30
 TOTAL STREAM AREA(ACRES) =       3.30
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       7.97

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR)  (INCH/HR)            (ACRES)    NODE
     1       24.16  15.44     2.548  0.24( 0.22) 0.92       11.5       20.00
     2        7.97  12.48     2.874  0.22( 0.19) 0.88        3.3       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       30.23  12.48     2.874  0.23( 0.21) 0.91       12.6       26.00
     2       31.16  15.44     2.548  0.23( 0.21) 0.91       14.8       20.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      31.16    Tc(MIN.) =    15.44
 EFFECTIVE AREA(ACRES) =      14.77   AREA-AVERAGED Fm(INCH/HR) =  0.21
 AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap =  0.91
 TOTAL AREA(ACRES) =      14.8
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     31.00 =    1297.00 FEET.

****************************************************************************
 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) =   598.00  DOWNSTREAM(FEET) =   595.50
 FLOW LENGTH(FEET) =   111.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  18.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  11.98
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       31.16
 PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =  15.60
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     32.00 =    1408.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     32.00 TO NODE     32.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  15.60
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.533
 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"       B        0.89      0.30      0.400    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
 SUBAREA AREA(ACRES) =     0.89     SUBAREA RUNOFF(CFS) =     1.93
 EFFECTIVE AREA(ACRES) =     15.66   AREA-AVERAGED Fm(INCH/HR) =  0.21
 AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap =  0.88
 TOTAL AREA(ACRES) =      15.7      PEAK FLOW RATE(CFS) =      32.80
```

```
****************************************************************************
 FLOW PROCESS FROM NODE      32.00 TO NODE      33.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   595.50  DOWNSTREAM(FEET) =   594.50
 FLOW LENGTH(FEET) =    35.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  13.39
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      32.80
 PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =  15.64
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     33.00 =    1443.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      33.00 TO NODE      33.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  15.64
 *  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
 "8-10 DWELLINGS/ACRE"       B        1.35      0.30      0.400    56
 RESIDENTIAL
 "8-10 DWELLINGS/ACRE"       D        0.62      0.20      0.400    75
 NATURAL GOOD COVER
 "OPEN BRUSH"                D        0.20      0.20      1.000    81
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.455
 SUBAREA AREA(ACRES) =    2.17      SUBAREA RUNOFF(CFS) =    4.71
 EFFECTIVE AREA(ACRES) =     17.83   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  0.83
 TOTAL AREA(ACRES) =       17.8       PEAK FLOW RATE(CFS) =      37.45

****************************************************************************
 FLOW PROCESS FROM NODE      33.00 TO NODE      34.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   594.00  DOWNSTREAM(FEET) =   590.50
 FLOW LENGTH(FEET) =   145.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  13.10
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      37.45
 PIPE TRAVEL TIME(MIN.) =   0.18    Tc(MIN.) =  15.83
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     34.00 =    1588.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      34.00 TO NODE      34.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  15.83
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.513
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "OPEN BRUSH"                C        1.68      0.25      1.000    75
 NATURAL GOOD COVER
 "OPEN BRUSH"                D        1.00      0.20      1.000    81
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.23
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    2.68      SUBAREA RUNOFF(CFS) =    5.50
 EFFECTIVE AREA(ACRES) =     20.51   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  0.85
 TOTAL AREA(ACRES) =       20.5       PEAK FLOW RATE(CFS) =      42.69

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)             (ACRES)    NODE
     1       43.29  12.86    2.825  0.24( 0.20) 0.84       18.3       26.00
     2       42.69  15.83    2.513  0.24( 0.20) 0.85       20.5       20.00
 NEW PEAK FLOW DATA ARE:
 PEAK FLOW RATE(CFS) =      43.29  Tc(MIN.) =  12.86
 AREA-AVERAGED Fm(INCH/HR) =  0.20  AREA-AVERAGED Fp(INCH/HR) =  0.24
 AREA-AVERAGED Ap =  0.84  EFFECTIVE AREA(ACRES) =      18.31

****************************************************************************
 FLOW PROCESS FROM NODE      34.00 TO NODE      35.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   590.50  DOWNSTREAM(FEET) =   581.00
 FLOW LENGTH(FEET) =   130.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  20.69
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      43.29
 PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =  12.97
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     35.00 =    1718.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      35.00 TO NODE      35.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  12.97
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.812
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "OPEN BRUSH"                B        0.26      0.30      1.000    63
```

```
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =     0.26      SUBAREA RUNOFF(CFS) =     0.59
 EFFECTIVE AREA(ACRES) =     18.57   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  0.84
 TOTAL AREA(ACRES) =       20.8       PEAK FLOW RATE(CFS) =      43.67

****************************************************************************
 FLOW PROCESS FROM NODE     35.00 TO NODE     36.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   581.00  DOWNSTREAM(FEET) =   571.00
 FLOW LENGTH(FEET) =   115.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  16.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  21.56
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      43.67
 PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =  13.06
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     36.00 =    1833.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     36.00 TO NODE     36.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  13.06
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.802
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "OPEN BRUSH"                B        0.76      0.30      1.000    63
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =     0.76      SUBAREA RUNOFF(CFS) =     1.71
 EFFECTIVE AREA(ACRES) =     19.33   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  0.85
 TOTAL AREA(ACRES) =       21.5       PEAK FLOW RATE(CFS) =      45.20
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =       21.5  TC(MIN.) =     13.06
 EFFECTIVE AREA(ACRES) =     19.33  AREA-AVERAGED Fm(INCH/HR)=  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap = 0.850
 PEAK FLOW RATE(CFS)    =      45.20

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
     1       45.20  13.06    2.802  0.24( 0.20) 0.85       19.3       26.00
     2       44.38  16.02    2.495  0.24( 0.20) 0.86       21.5       20.00
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
         (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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 ************************* DESCRIPTION OF STUDY *************************
* Hydrology Study for Serrano Highlands, Tract 15594                    *
* Proposed Condition, Drainage "B"                                      *
* 25-year Storm                                                         *
 **************************************************************************

  FILE NAME: SH_B.DAT
  TIME/DATE OF STUDY: 16:23 07/21/2011
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

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

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)     SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ======  =====  =======
  1   14.0       9.0   0.020/0.020/0.020   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) =   203.00
  ELEVATION DATA: UPSTREAM(FEET) =    690.00  DOWNSTREAM(FEET) =    650.00
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =  10.837
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.113
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "OPEN BRUSH"                C        0.32      0.25      1.000    75   10.84
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.82
  TOTAL AREA(ACRES) =      0.32   PEAK FLOW RATE(CFS) =      0.82

**************************************************************************
  FLOW PROCESS FROM NODE       2.00 TO NODE       3.00 IS CODE =  52
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    650.00  DOWNSTREAM(FEET) =    615.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   230.00   CHANNEL SLOPE =  0.1522
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.82
  FLOW VELOCITY(FEET/SEC) =   4.74 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.81   Tc(MIN.) =  11.64
  LONGEST FLOWPATH FROM NODE       1.00 TO NODE       3.00 =     433.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE       3.00 TO NODE       3.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN) =  11.64
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.989
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL GOOD COVER
  "OPEN BRUSH"                D        1.00      0.20      1.000    81
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =     1.00      SUBAREA RUNOFF(CFS) =     2.51
  EFFECTIVE AREA(ACRES) =      1.32   AREA-AVERAGED Fm(INCH/HR) =  0.21
  AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =        1.3       PEAK FLOW RATE(CFS) =        3.30

**************************************************************************
  FLOW PROCESS FROM NODE       3.00 TO NODE       4.00 IS CODE =  31
--------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    615.00  DOWNSTREAM(FEET) =    308.00
  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   1.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  45.59
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       3.30
 PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =  11.67
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =     498.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  11.67
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.986
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "OPEN BRUSH"                D        0.37      0.20      1.000    81
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =     0.37      SUBAREA RUNOFF(CFS) =     0.93
 EFFECTIVE AREA(ACRES) =      1.69   AREA-AVERAGED Fm(INCH/HR) =  0.21
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =        1.7       PEAK FLOW RATE(CFS) =       4.22

****************************************************************************
 FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   608.00  DOWNSTREAM(FEET) =   605.50
 FLOW LENGTH(FEET) =   100.00   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.) =   7.71
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       4.22
 PIPE TRAVEL TIME(MIN.) =   0.22    Tc(MIN.) =  11.88
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =     598.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      5.00 TO NODE      5.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  11.88
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.955
 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"       C        0.28      0.25      0.400    69
 RESIDENTIAL
 "8-10 DWELLINGS/ACRE"       D        1.20      0.20      0.400    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.21
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
 SUBAREA AREA(ACRES) =     1.48      SUBAREA RUNOFF(CFS) =     3.82
 EFFECTIVE AREA(ACRES) =      3.17   AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.72
 TOTAL AREA(ACRES) =        3.2       PEAK FLOW RATE(CFS) =       8.00

****************************************************************************
 FLOW PROCESS FROM NODE      5.00 TO NODE      5.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  11.88
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.955
 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        1.13      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) =     1.13      SUBAREA RUNOFF(CFS) =     2.92
 EFFECTIVE AREA(ACRES) =      4.30   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.64
 TOTAL AREA(ACRES) =        4.3       PEAK FLOW RATE(CFS) =      10.92

****************************************************************************
 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) =   605.50  DOWNSTREAM(FEET) =   605.00
 FLOW LENGTH(FEET) =    60.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.47
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      10.92
 PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =  12.04
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 =     658.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      6.00 TO NODE      6.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  12.04
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.933
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "OPEN BRUSH"                C        0.36      0.25      1.000    75
 NATURAL GOOD COVER
 "OPEN BRUSH"                D        0.16      0.20      1.000    81
```

```
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.23
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =     0.52     SUBAREA RUNOFF(CFS) =     1.26
 EFFECTIVE AREA(ACRES) =     4.82   AREA-AVERAGED Fm(INCH/HR) =  0.14
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.68
 TOTAL AREA(ACRES) =      4.8      PEAK FLOW RATE(CFS) =     12.10

****************************************************************************
 FLOW PROCESS FROM NODE      6.00 TO NODE      7.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   605.00  DOWNSTREAM(FEET) =   591.00
 FLOW LENGTH(FEET) =   415.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  11.31
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     12.10
 PIPE TRAVEL TIME(MIN.) =   0.61    Tc(MIN.) =  12.65
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =    1073.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  12.65
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.852
 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"       B        0.16      0.30      0.400    56
 RESIDENTIAL
 "8-10 DWELLINGS/ACRE"       C        0.66      0.25      0.400    69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.26
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
 SUBAREA AREA(ACRES) =     0.82     SUBAREA RUNOFF(CFS) =     2.03
 EFFECTIVE AREA(ACRES) =     5.64   AREA-AVERAGED Fm(INCH/HR) =  0.14
 AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  0.64
 TOTAL AREA(ACRES) =      5.6      PEAK FLOW RATE(CFS) =     13.78

****************************************************************************
 FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  12.65
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.852
 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"       B        0.69      0.30      0.400    56
 RESIDENTIAL
 "8-10 DWELLINGS/ACRE"       C        0.50      0.25      0.400    69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.28
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
 SUBAREA AREA(ACRES) =     1.19     SUBAREA RUNOFF(CFS) =     2.94
 EFFECTIVE AREA(ACRES) =     6.83   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  0.59
 TOTAL AREA(ACRES) =      6.8      PEAK FLOW RATE(CFS) =     16.72

****************************************************************************
 FLOW PROCESS FROM NODE      7.00 TO NODE      8.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   591.00  DOWNSTREAM(FEET) =   580.50
 FLOW LENGTH(FEET) =   340.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  11.57
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     16.72
 PIPE TRAVEL TIME(MIN.) =   0.49    Tc(MIN.) =  13.14
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      8.00 =    1413.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      8.00 TO NODE      8.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  13.14
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.792
 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        0.92      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) =     0.92     SUBAREA RUNOFF(CFS) =     2.25
 EFFECTIVE AREA(ACRES) =     7.75   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  0.57
 TOTAL AREA(ACRES) =      7.8      PEAK FLOW RATE(CFS) =     18.59

****************************************************************************
 FLOW PROCESS FROM NODE      8.00 TO NODE      8.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  13.14
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.792
 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        0.77      0.20      0.400    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
```

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 SUBAREA AREA(ACRES) =     0.77      SUBAREA RUNOFF(CFS) =     1.88
 EFFECTIVE AREA(ACRES) =      8.52   AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  0.56
 TOTAL AREA(ACRES) =        8.5       PEAK FLOW RATE(CFS) =      20.47

****************************************************************************
 FLOW PROCESS FROM NODE      8.00 TO NODE     15.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   580.50  DOWNSTREAM(FEET) =   580.00
 FLOW LENGTH(FEET) =    55.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  19.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.63
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      20.47
 PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =  13.26
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE     15.00 =    1468.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =  13.26
 RAINFALL INTENSITY(INCH/HR) =   2.78
 AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.22
 AREA-AVERAGED Ap =  0.56
 EFFECTIVE STREAM AREA(ACRES) =       8.52
 TOTAL STREAM AREA(ACRES) =       8.52
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      20.47

****************************************************************************
 FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   266.00
 ELEVATION DATA: UPSTREAM(FEET) =    650.00  DOWNSTREAM(FEET) =    610.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.745
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.840
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL GOOD COVER
 "OPEN BRUSH"                 D        0.75      0.20      1.000    81   12.74
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      1.78
 TOTAL AREA(ACRES) =      0.75   PEAK FLOW RATE(CFS) =      1.78

****************************************************************************
 FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  61
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  610.00  DOWNSTREAM ELEVATION(FEET) =  584.00
 STREET LENGTH(FEET) =   345.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 17.60

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  12.60
 INSIDE STREET CROSSFALL(DECIMAL) =  0.017
 OUTSIDE STREET CROSSFALL(DECIMAL) =  0.017

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

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.49
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.24
   HALFSTREET FLOOD WIDTH(FEET) =    6.53
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.64
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.12
 STREET FLOW TRAVEL TIME(MIN.) =   1.24   Tc(MIN.) =  13.98
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.695
 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        2.30      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) =     2.30      SUBAREA RUNOFF(CFS) =     5.41
 EFFECTIVE AREA(ACRES) =      3.05    AREA-AVERAGED Fm(INCH/HR) =  0.11
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.55
 TOTAL AREA(ACRES) =        3.0       PEAK FLOW RATE(CFS) =       7.10

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.27   HALFSTREET FLOOD WIDTH(FEET) =   8.20
 FLOW VELOCITY(FEET/SEC.) =  5.12   DEPTH*VELOCITY(FT*FT/SEC.) =   1.38
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     611.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   584.00  DOWNSTREAM(FEET) =   583.00
 FLOW LENGTH(FEET) =    25.00   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
```

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 PIPE-FLOW VELOCITY(FEET/SEC.) =  10.53
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =        7.10
 PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =  14.02
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     13.00 =     636.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     13.00 TO NODE     13.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  14.02
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.691
 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        0.77      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) =     0.77     SUBAREA RUNOFF(CFS) =     1.81
 EFFECTIVE AREA(ACRES) =      3.82   AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.52
 TOTAL AREA(ACRES) =        3.8       PEAK FLOW RATE(CFS) =       8.90

****************************************************************************
 FLOW PROCESS FROM NODE     13.00 TO NODE     15.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   583.00  DOWNSTREAM(FEET) =   580.00
 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   8.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  11.79
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =        8.90
 PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =  14.11
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     15.00 =     701.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 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.) =  14.11
 RAINFALL INTENSITY(INCH/HR) =   2.68
 AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.52
 EFFECTIVE STREAM AREA(ACRES) =       3.82
 TOTAL STREAM AREA(ACRES) =       3.82
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       8.90

 ** CONFLUENCE DATA **
  STREAM       Q      Tc    Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER      (CFS)  (MIN.)  (INCH/HR)  (INCH/HR)           (ACRES)    NODE
     1        20.47  13.26     2.777  0.22( 0.12) 0.56       8.5       1.00
     2         8.90  14.11     2.681  0.20( 0.10) 0.52       3.8      10.00

 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        29.14  13.26     2.777  0.21( 0.12) 0.54      12.1       1.00
     2        28.62  14.11     2.681  0.21( 0.12) 0.54      12.3      10.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      29.14    Tc(MIN.) =    13.26
 EFFECTIVE AREA(ACRES) =      12.11   AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.54
 TOTAL AREA(ACRES) =      12.3
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE     15.00 =    1468.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =      12.3  TC(MIN.) =     13.26
 EFFECTIVE AREA(ACRES) =      12.11  AREA-AVERAGED Fm(INCH/HR)=  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap = 0.544
 PEAK FLOW RATE(CFS)    =      29.14

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc    Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER      (CFS)  (MIN.)  (INCH/HR)  (INCH/HR)           (ACRES)    NODE
     1        29.14  13.26     2.777  0.21( 0.12) 0.54      12.1       1.00
     2        28.62  14.11     2.681  0.21( 0.12) 0.54      12.3      10.00
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

C. 100-YEAR STORM

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**************************************************************************
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 ************************* DESCRIPTION OF STUDY *************************
* Hydrology Study for Serrano Highlands, Tract 15594                    *
* Proposed Condition, Drainage Area "A"                                 *
* 100-year Storm                                                        *
 ************************************************************************

  FILE NAME: SH_A.DAT
  TIME/DATE OF STUDY: 17:59 07/18/2011
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

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

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)     SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  =====  ====  =====  =======
  1   14.0       9.0   0.020/0.020/0.020    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      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) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =    695.00  DOWNSTREAM(FEET) =    640.00
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =  12.853
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.602
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "OPEN BRUSH"                D        1.00      0.20       1.000    95   12.85
  NATURAL GOOD COVER
  "OPEN BRUSH"                B        0.23      0.30       1.000    81   12.85
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.22
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      3.75
  TOTAL AREA(ACRES) =      1.23   PEAK FLOW RATE(CFS) =      3.75

**************************************************************************
  FLOW PROCESS FROM NODE      21.00 TO NODE      22.00 IS CODE =  52
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    640.00  DOWNSTREAM(FEET) =    608.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   472.00   CHANNEL SLOPE =  0.0678
  CHANNEL FLOW THRU SUBAREA(CFS) =      3.75
  FLOW VELOCITY(FEET/SEC) =   5.14 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.53   Tc(MIN.) =  14.38
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =     772.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE      22.00 TO NODE      22.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN) =  14.38
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.377
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL GOOD COVER
  "OPEN BRUSH"                B        2.72      0.30       1.000    81
  NATURAL GOOD COVER
  "OPEN BRUSH"                C        0.87      0.25       1.000    91
  NATURAL GOOD COVER
  "OPEN BRUSH"                D        2.70      0.20       1.000    95
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =     6.29     SUBAREA RUNOFF(CFS) =    17.70
  EFFECTIVE AREA(ACRES) =      7.52   AREA-AVERAGED Fm(INCH/HR) =  0.25
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =        7.5       PEAK FLOW RATE(CFS) =      21.20

**************************************************************************
  FLOW PROCESS FROM NODE      22.00 TO NODE      23.00 IS CODE =  31
--------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   608.00  DOWNSTREAM(FEET) =   607.00
 FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.78
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      21.20
 PIPE TRAVEL TIME(MIN.) =   0.39    Tc(MIN.) =  14.78
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     23.00 =     932.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     23.00 TO NODE     23.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  14.78
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.325
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "OPEN BRUSH"                C       0.76      0.25      1.000     91
 NATURAL GOOD COVER
 "OPEN BRUSH"                D       1.35      0.20      1.000     95
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.22
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    2.11     SUBAREA RUNOFF(CFS) =    5.90
 EFFECTIVE AREA(ACRES) =     9.63   AREA-AVERAGED Fm(INCH/HR) =  0.24
 AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =       9.6       PEAK FLOW RATE(CFS) =      26.75

****************************************************************************
 FLOW PROCESS FROM NODE     23.00 TO NODE     24.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   607.00  DOWNSTREAM(FEET) =   598.50
 FLOW LENGTH(FEET) =   315.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.61
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      26.75
 PIPE TRAVEL TIME(MIN.) =   0.42    Tc(MIN.) =  15.19
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     24.00 =    1247.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     24.00 TO NODE     24.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  15.19
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.273
 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       1.22      0.20      0.400     91
 NATURAL GOOD COVER
 "OPEN BRUSH"                D       0.30      0.20      1.000     95
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.518
 SUBAREA AREA(ACRES) =    1.52     SUBAREA RUNOFF(CFS) =    4.34
 EFFECTIVE AREA(ACRES) =    11.15   AREA-AVERAGED Fm(INCH/HR) =  0.22
 AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  0.93
 TOTAL AREA(ACRES) =       11.1       PEAK FLOW RATE(CFS) =      30.63

****************************************************************************
 FLOW PROCESS FROM NODE     24.00 TO NODE     24.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  15.19
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.273
 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"       B       0.16      0.30      0.400     76
 COMMERCIAL                  D       0.16      0.20      0.100     91
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.28
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.250
 SUBAREA AREA(ACRES) =    0.32     SUBAREA RUNOFF(CFS) =    0.92
 EFFECTIVE AREA(ACRES) =    11.47   AREA-AVERAGED Fm(INCH/HR) =  0.22
 AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  0.92
 TOTAL AREA(ACRES) =       11.5       PEAK FLOW RATE(CFS) =      31.55

****************************************************************************
 FLOW PROCESS FROM NODE     24.00 TO NODE     31.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   598.50  DOWNSTREAM(FEET) =   598.00
 FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  30.0 INCH PIPE IS  20.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   9.03
 ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      31.55
 PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =  15.29
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     31.00 =    1297.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     31.00 TO NODE     31.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =  15.29
 RAINFALL INTENSITY(INCH/HR) =   3.26
```

```
 AREA-AVERAGED Fm(INCH/HR) =  0.22
 AREA-AVERAGED Fp(INCH/HR) =  0.24
 AREA-AVERAGED Ap =  0.92
 EFFECTIVE STREAM AREA(ACRES) =      11.47
 TOTAL STREAM AREA(ACRES) =      11.47
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      31.55

****************************************************************************
 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) =   230.00
 ELEVATION DATA: UPSTREAM(FEET) =    687.00  DOWNSTREAM(FEET) =    645.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.566
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.826
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL GOOD COVER
 "OPEN BRUSH"                C        0.44      0.25      1.000    91   11.57
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      1.42
 TOTAL AREA(ACRES) =      0.44   PEAK FLOW RATE(CFS) =      1.42

****************************************************************************
 FLOW PROCESS FROM NODE     27.00 TO NODE     28.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    645.00  DOWNSTREAM(FEET) =    620.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   170.00   CHANNEL SLOPE =  0.1471
 NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
 CHANNEL FLOW THRU SUBAREA(CFS) =      1.42
 FLOW VELOCITY(FEET/SEC) =   5.07 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   0.56   Tc(MIN.) =  12.12
 LONGEST FLOWPATH FROM NODE     26.00 TO NODE     28.00 =     400.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     28.00 TO NODE     28.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  12.12
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.724
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "OPEN BRUSH"                C        0.59      0.25      1.000    91
 NATURAL GOOD COVER
 "OPEN BRUSH"                D        0.66      0.20      1.000    95
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.22
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =     1.25      SUBAREA RUNOFF(CFS) =     3.94
 EFFECTIVE AREA(ACRES) =      1.69   AREA-AVERAGED Fm(INCH/HR) =  0.23
 AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =      1.7       PEAK FLOW RATE(CFS) =      5.31

****************************************************************************
 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) =   620.00  DOWNSTREAM(FEET) =   610.00
 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   4.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  15.77
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      5.31
 PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =  12.19
 LONGEST FLOWPATH FROM NODE     26.00 TO NODE     29.00 =     465.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     29.00 TO NODE     29.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  12.19
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.712
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "OPEN BRUSH"                C        0.21      0.25      1.000    91
 NATURAL GOOD COVER
 "OPEN BRUSH"                D        0.74      0.20      1.000    95
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.21
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =     0.95      SUBAREA RUNOFF(CFS) =     2.99
 EFFECTIVE AREA(ACRES) =      2.64   AREA-AVERAGED Fm(INCH/HR) =  0.22
 AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =      2.6       PEAK FLOW RATE(CFS) =      8.29

****************************************************************************
 FLOW PROCESS FROM NODE     29.00 TO NODE     30.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   610.00  DOWNSTREAM(FEET) =   602.00
 FLOW LENGTH(FEET) =   155.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.06
```

```
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       8.29
 PIPE TRAVEL TIME(MIN.) =   0.21    Tc(MIN.) =  12.41
 LONGEST FLOWPATH FROM NODE     26.00 TO NODE     30.00 =     620.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     30.00 TO NODE     30.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  12.41
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.676
 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        0.66      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) =     0.66     SUBAREA RUNOFF(CFS) =     2.14
 EFFECTIVE AREA(ACRES) =      3.30   AREA-AVERAGED Fm(INCH/HR) =  0.19
 AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  0.88
 TOTAL AREA(ACRES) =        3.3       PEAK FLOW RATE(CFS) =      10.34

****************************************************************************
 FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   602.00  DOWNSTREAM(FEET) =   598.00
 FLOW LENGTH(FEET) =    25.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  19.31
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      10.34
 PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =  12.43
 LONGEST FLOWPATH FROM NODE     26.00 TO NODE     31.00 =     645.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     31.00 TO NODE     31.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =  12.43
 RAINFALL INTENSITY(INCH/HR) =   3.67
 AREA-AVERAGED Fm(INCH/HR) =  0.19
 AREA-AVERAGED Fp(INCH/HR) =  0.22
 AREA-AVERAGED Ap =  0.88
 EFFECTIVE STREAM AREA(ACRES) =       3.30
 TOTAL STREAM AREA(ACRES) =       3.30
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      10.34

** CONFLUENCE DATA **
 STREAM       Q      Tc    Intensity   Fp(Fm)      Ap      Ae      HEADWATER
 NUMBER     (CFS)  (MIN.)  (INCH/HR)  (INCH/HR)            (ACRES)    NODE
    1       31.55  15.29     3.261   0.24( 0.22) 0.92       11.5       20.00
    2       10.34  12.43     3.672   0.22( 0.19) 0.88        3.3       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       39.45  12.43     3.672   0.23( 0.21) 0.91       12.6       26.00
    2       40.67  15.29     3.261   0.23( 0.21) 0.91       14.8       20.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      40.67    Tc(MIN.) =    15.29
 EFFECTIVE AREA(ACRES) =      14.77   AREA-AVERAGED Fm(INCH/HR) =  0.21
 AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap =  0.91
 TOTAL AREA(ACRES) =       14.8
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     31.00 =    1297.00 FEET.

****************************************************************************
 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) =   598.00  DOWNSTREAM(FEET) =   595.50
 FLOW LENGTH(FEET) =   111.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  20.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.89
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      40.67
 PIPE TRAVEL TIME(MIN.) =   0.14    Tc(MIN.) =  15.43
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     32.00 =    1408.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     32.00 TO NODE     32.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  15.43
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.244
 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"       B        0.89      0.30      0.400    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
 SUBAREA AREA(ACRES) =     0.89     SUBAREA RUNOFF(CFS) =     2.50
 EFFECTIVE AREA(ACRES) =      15.66   AREA-AVERAGED Fm(INCH/HR) =  0.21
 AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap =  0.88
 TOTAL AREA(ACRES) =       15.7       PEAK FLOW RATE(CFS) =      42.81
```

```
****************************************************************************
 FLOW PROCESS FROM NODE      32.00 TO NODE      33.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   595.50  DOWNSTREAM(FEET) =   594.50
 FLOW LENGTH(FEET) =    35.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  14.37
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      42.81
 PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =  15.47
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     33.00 =    1443.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      33.00 TO NODE      33.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  15.47
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.239
 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"       B        1.35      0.30      0.400    76
 RESIDENTIAL
 "8-10 DWELLINGS/ACRE"       D        0.62      0.20      0.400    91
 NATURAL GOOD COVER
 "OPEN BRUSH"                D        0.20      0.20      1.000    95
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.455
 SUBAREA AREA(ACRES) =   2.17     SUBAREA RUNOFF(CFS) =    6.10
 EFFECTIVE AREA(ACRES) =    17.83   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  0.83
 TOTAL AREA(ACRES) =      17.8      PEAK FLOW RATE(CFS) =      48.84

****************************************************************************
 FLOW PROCESS FROM NODE      33.00 TO NODE      34.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   594.00  DOWNSTREAM(FEET) =   590.50
 FLOW LENGTH(FEET) =   145.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  30.0 INCH PIPE IS  20.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  14.01
 ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      48.84
 PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =  15.64
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     34.00 =    1588.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      34.00 TO NODE      34.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  15.64
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.219
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "OPEN BRUSH"                C        1.68      0.25      1.000    91
 NATURAL GOOD COVER
 "OPEN BRUSH"                D        1.00      0.20      1.000    95
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.23
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =   2.68     SUBAREA RUNOFF(CFS) =    7.21
 EFFECTIVE AREA(ACRES) =    20.51   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  0.85
 TOTAL AREA(ACRES) =      20.5      PEAK FLOW RATE(CFS) =      55.72

 ** PEAK FLOW RATE TABLE **
  STREAM      Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER    (CFS)  (MIN.) (INCH/HR) (INCH/HR)             (ACRES)    NODE
     1      56.44  12.79    3.613  0.24( 0.20) 0.84      18.4       26.00
     2      55.72  15.64    3.219  0.24( 0.20) 0.85      20.5       20.00
 NEW PEAK FLOW DATA ARE:
 PEAK FLOW RATE(CFS) =    56.44  Tc(MIN.) =  12.79
 AREA-AVERAGED Fm(INCH/HR) =  0.20  AREA-AVERAGED Fp(INCH/HR) =  0.24
 AREA-AVERAGED Ap =  0.84  EFFECTIVE AREA(ACRES) =    18.37

****************************************************************************
 FLOW PROCESS FROM NODE      34.00 TO NODE      35.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   590.50  DOWNSTREAM(FEET) =   581.00
 FLOW LENGTH(FEET) =   130.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  18.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  21.58
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      56.44
 PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =  12.89
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     35.00 =    1718.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      35.00 TO NODE      35.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  12.89
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.597
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "OPEN BRUSH"                B        0.26      0.30      1.000    81
```

```
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =     0.26      SUBAREA RUNOFF(CFS) =     0.77
 EFFECTIVE AREA(ACRES) =     18.63   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  0.84
 TOTAL AREA(ACRES) =       20.8      PEAK FLOW RATE(CFS) =      56.95

****************************************************************************
 FLOW PROCESS FROM NODE     35.00 TO NODE     36.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   581.00  DOWNSTREAM(FEET) =   571.00
 FLOW LENGTH(FEET) =   115.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  23.34
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      56.95
 PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =  12.97
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     36.00 =    1833.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     36.00 TO NODE     36.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  12.97
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.583
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "OPEN BRUSH"                B        0.76      0.30      1.000    81
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =     0.76      SUBAREA RUNOFF(CFS) =     2.25
 EFFECTIVE AREA(ACRES) =     19.39   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  0.85
 TOTAL AREA(ACRES) =       21.5      PEAK FLOW RATE(CFS) =      58.97
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =       21.5  TC(MIN.) =     12.97
 EFFECTIVE AREA(ACRES) =     19.39  AREA-AVERAGED Fm(INCH/HR)=  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap = 0.850
 PEAK FLOW RATE(CFS)    =      58.97

 ** PEAK FLOW RATE TABLE **
  STREAM       Q     Tc   Intensity   Fp(Fm)      Ap     Ae     HEADWATER
  NUMBER     (CFS) (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
    1       58.97  12.97    3.583  0.24( 0.20) 0.85      19.4      26.00
    2       57.98  15.83    3.197  0.24( 0.20) 0.86      21.5      20.00
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
        (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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 ************************* DESCRIPTION OF STUDY *************************
* Hydrology Study for Serrano Highlands, Tract 15594                    *
* Proposed Condition, Drainage "B"                                      *
* 100-year Storm                                                        *
 ************************************************************************

  FILE NAME: SH_B.DAT
  TIME/DATE OF STUDY: 16:48 07/21/2011
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                  --*TIME-OF-CONCENTRATION MODEL*--

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

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)     SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  =====  ====  =====  =======
  1   14.0       9.0   0.020/0.020/0.020    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) =   203.00
  ELEVATION DATA: UPSTREAM(FEET) =    690.00  DOWNSTREAM(FEET) =    650.00
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =  10.837
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.972
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "OPEN BRUSH"                 C       0.32      0.25      1.000    91   10.84
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      1.07
  TOTAL AREA(ACRES) =      0.32   PEAK FLOW RATE(CFS) =      1.07

**************************************************************************
  FLOW PROCESS FROM NODE       2.00 TO NODE       3.00 IS CODE =  52
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    650.00  DOWNSTREAM(FEET) =    615.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   230.00   CHANNEL SLOPE =  0.1522
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =      1.07
  FLOW VELOCITY(FEET/SEC) =   4.81 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.80   Tc(MIN.) =  11.63
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     433.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE       3.00 TO NODE       3.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN) =  11.63
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.814
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL GOOD COVER
  "OPEN BRUSH"                 D       1.00      0.20      1.000    95
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =     1.00   SUBAREA RUNOFF(CFS) =     3.25
  EFFECTIVE AREA(ACRES) =     1.32   AREA-AVERAGED Fm(INCH/HR) =  0.21
  AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =      1.3   PEAK FLOW RATE(CFS) =      4.28

**************************************************************************
  FLOW PROCESS FROM NODE       3.00 TO NODE       4.00 IS CODE =  31
--------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    615.00  DOWNSTREAM(FEET) =    308.00
  FLOW LENGTH(FEET) =    65.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
```
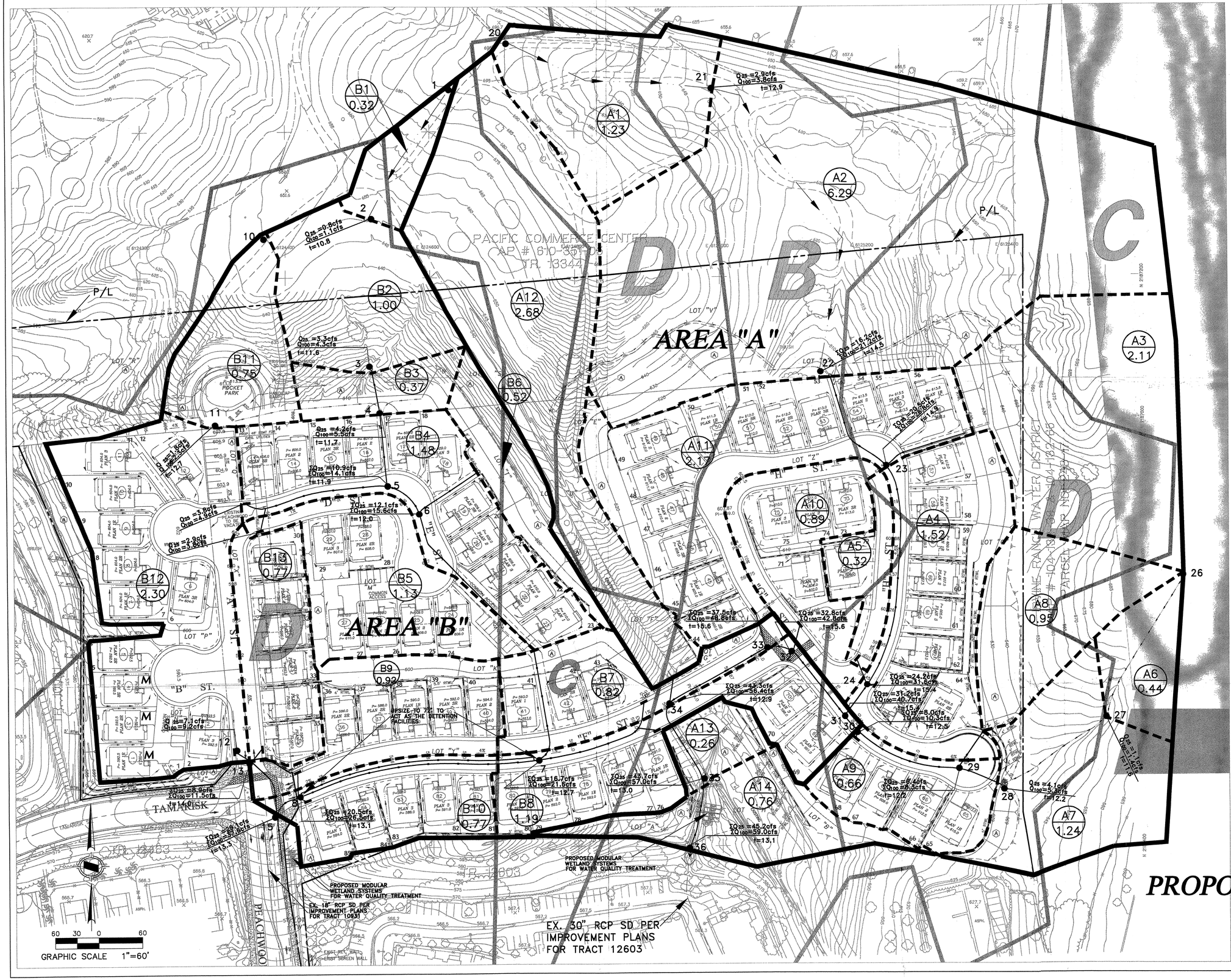

```
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   1.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  49.23
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       4.28
 PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =  11.66
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =     498.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  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
 NATURAL GOOD COVER
 "OPEN BRUSH"                 D        0.37      0.20      1.000    95
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =     0.37      SUBAREA RUNOFF(CFS) =     1.20
 EFFECTIVE AREA(ACRES) =      1.69   AREA-AVERAGED Fm(INCH/HR) =  0.21
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =        1.7       PEAK FLOW RATE(CFS) =       5.48

****************************************************************************
 FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   608.00  DOWNSTREAM(FEET) =   605.50
 FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   8.27
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       5.48
 PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =  11.86
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =     598.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      5.00 TO NODE      5.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  11.86
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.772
 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"        C        0.28      0.25      0.400    86
 RESIDENTIAL
 "8-10 DWELLINGS/ACRE"        D        1.20      0.20      0.400    91
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.21
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
 SUBAREA AREA(ACRES) =     1.48      SUBAREA RUNOFF(CFS) =     4.91
 EFFECTIVE AREA(ACRES) =      3.17   AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.72
 TOTAL AREA(ACRES) =        3.2       PEAK FLOW RATE(CFS) =      10.33

****************************************************************************
 FLOW PROCESS FROM NODE      5.00 TO NODE      5.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  11.86
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.772
 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        1.13      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) =     1.13      SUBAREA RUNOFF(CFS) =     3.76
 EFFECTIVE AREA(ACRES) =      4.30   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.64
 TOTAL AREA(ACRES) =        4.3       PEAK FLOW RATE(CFS) =      14.09

****************************************************************************
 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) =   605.50  DOWNSTREAM(FEET) =   605.00
 FLOW LENGTH(FEET) =    60.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  17.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.68
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      14.09
 PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =  12.01
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 =     658.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      6.00 TO NODE      6.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  12.01
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.745
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "OPEN BRUSH"                 C        0.36      0.25      1.000    91
 NATURAL GOOD COVER
 "OPEN BRUSH"                 D        0.16      0.20      1.000    95
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.23
```

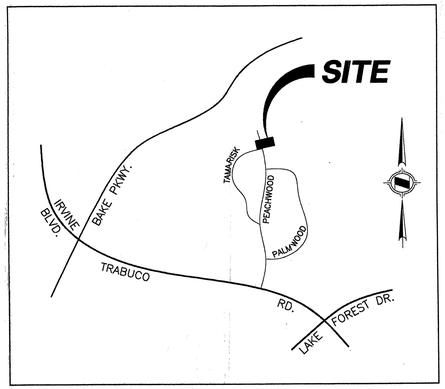
```
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =     0.52      SUBAREA RUNOFF(CFS) =     1.64
 EFFECTIVE AREA(ACRES) =      4.82   AREA-AVERAGED Fm(INCH/HR) =  0.14
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.68
 TOTAL AREA(ACRES) =        4.8       PEAK FLOW RATE(CFS) =      15.63

****************************************************************************
 FLOW PROCESS FROM NODE      6.00 TO NODE      7.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   605.00  DOWNSTREAM(FEET) =   591.00
 FLOW LENGTH(FEET) =   415.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  11.90
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      15.63
 PIPE TRAVEL TIME(MIN.) =   0.58    Tc(MIN.) =  12.59
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =    1073.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  12.59
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.645
 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"       B        0.16      0.30      0.400    76
 RESIDENTIAL
 "8-10 DWELLINGS/ACRE"       C        0.66      0.25      0.400    86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.26
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
 SUBAREA AREA(ACRES) =     0.82      SUBAREA RUNOFF(CFS) =     2.61
 EFFECTIVE AREA(ACRES) =      5.64   AREA-AVERAGED Fm(INCH/HR) =  0.14
 AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  0.64
 TOTAL AREA(ACRES) =        5.6       PEAK FLOW RATE(CFS) =      17.81

****************************************************************************
 FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  12.59
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.645
 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"       B        0.69      0.30      0.400    76
 RESIDENTIAL
 "8-10 DWELLINGS/ACRE"       C        0.50      0.25      0.400    86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.28
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
 SUBAREA AREA(ACRES) =     1.19      SUBAREA RUNOFF(CFS) =     3.78
 EFFECTIVE AREA(ACRES) =      6.83   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  0.59
 TOTAL AREA(ACRES) =        6.8       PEAK FLOW RATE(CFS) =      21.59

****************************************************************************
 FLOW PROCESS FROM NODE      7.00 TO NODE      8.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   591.00  DOWNSTREAM(FEET) =   580.50
 FLOW LENGTH(FEET) =   340.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.52
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      21.59
 PIPE TRAVEL TIME(MIN.) =   0.45    Tc(MIN.) =  13.04
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      8.00 =    1413.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      8.00 TO NODE      8.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  13.04
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.572
 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        0.92      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) =     0.92      SUBAREA RUNOFF(CFS) =     2.89
 EFFECTIVE AREA(ACRES) =      7.75   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  0.57
 TOTAL AREA(ACRES) =        7.8       PEAK FLOW RATE(CFS) =      24.03

****************************************************************************
 FLOW PROCESS FROM NODE      8.00 TO NODE      8.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  13.04
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.572
 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        0.77      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) =     0.77      SUBAREA RUNOFF(CFS) =     2.42
```

```
 EFFECTIVE AREA(ACRES) =       8.52   AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  0.56
 TOTAL AREA(ACRES) =         8.5        PEAK FLOW RATE(CFS) =       26.45

****************************************************************************
 FLOW PROCESS FROM NODE       8.00 TO NODE      15.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    580.50  DOWNSTREAM(FEET) =    580.00
 FLOW LENGTH(FEET) =     55.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  20.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   8.21
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       26.45
 PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =  13.15
 LONGEST FLOWPATH FROM NODE       1.00 TO NODE      15.00 =    1468.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      15.00 TO NODE      15.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =  13.15
 RAINFALL INTENSITY(INCH/HR) =   3.55
 AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.22
 AREA-AVERAGED Ap =  0.56
 EFFECTIVE STREAM AREA(ACRES) =        8.52
 TOTAL STREAM AREA(ACRES) =        8.52
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       26.45

****************************************************************************
 FLOW PROCESS FROM NODE      10.00 TO NODE      11.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   266.00
 ELEVATION DATA: UPSTREAM(FEET) =    650.00  DOWNSTREAM(FEET) =    610.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.745
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.620
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL GOOD COVER
 "OPEN BRUSH"                 D        0.75      0.20      1.000    95   12.74
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =       2.31
 TOTAL AREA(ACRES) =       0.75   PEAK FLOW RATE(CFS) =       2.31

****************************************************************************
 FLOW PROCESS FROM NODE      11.00 TO NODE      12.00 IS CODE =  61
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  610.00  DOWNSTREAM ELEVATION(FEET) =  584.00
 STREET LENGTH(FEET) =   345.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 17.60

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  12.60
 INSIDE STREET CROSSFALL(DECIMAL) =  0.017
 OUTSIDE STREET CROSSFALL(DECIMAL) =  0.017

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

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.79
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.26
   HALFSTREET FLOOD WIDTH(FEET) =    7.41
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.92
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.26
 STREET FLOW TRAVEL TIME(MIN.) =   1.17   Tc(MIN.) =  13.91
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.442
 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        2.30      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) =     2.30      SUBAREA RUNOFF(CFS) =     6.96
 EFFECTIVE AREA(ACRES) =       3.05    AREA-AVERAGED Fm(INCH/HR) =  0.11
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.55
 TOTAL AREA(ACRES) =         3.0        PEAK FLOW RATE(CFS) =        9.15

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   9.28
 FLOW VELOCITY(FEET/SEC.) =  5.36   DEPTH*VELOCITY(FT*FT/SEC.) =   1.55
 LONGEST FLOWPATH FROM NODE      10.00 TO NODE      12.00 =      611.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      12.00 TO NODE      13.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    584.00  DOWNSTREAM(FEET) =    583.00
 FLOW LENGTH(FEET) =     25.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  11.26
```

```
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =        9.15
 PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =  13.95
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     13.00 =     636.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     13.00 TO NODE     13.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =  13.95
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.437
 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        0.77      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) =     0.77      SUBAREA RUNOFF(CFS) =     2.33
 EFFECTIVE AREA(ACRES) =      3.82   AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.52
 TOTAL AREA(ACRES) =        3.8       PEAK FLOW RATE(CFS) =       11.46

****************************************************************************
 FLOW PROCESS FROM NODE     13.00 TO NODE     15.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   583.00  DOWNSTREAM(FEET) =   580.00
 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   9.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.57
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      11.46
 PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =  14.04
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     15.00 =     701.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 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.) =  14.04
 RAINFALL INTENSITY(INCH/HR) =   3.42
 AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.52
 EFFECTIVE STREAM AREA(ACRES) =       3.82
 TOTAL STREAM AREA(ACRES) =       3.82
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      11.46

** CONFLUENCE DATA **
 STREAM       Q      Tc    Intensity   Fp(Fm)      Ap      Ae      HEADWATER
 NUMBER     (CFS)  (MIN.)  (INCH/HR)  (INCH/HR)            (ACRES)    NODE
    1       26.45  13.15     3.555  0.22( 0.12) 0.56        8.5        1.00
    2       11.46  14.04     3.425  0.20( 0.10) 0.52        3.8       10.00

 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       37.61  13.15     3.555  0.21( 0.12) 0.54       12.1        1.00
    2       36.91  14.04     3.425  0.21( 0.12) 0.54       12.3       10.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      37.61    Tc(MIN.) =    13.15
 EFFECTIVE AREA(ACRES) =      12.10   AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  0.54
 TOTAL AREA(ACRES) =       12.3
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE     15.00 =    1468.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =       12.3  TC(MIN.) =     13.15
 EFFECTIVE AREA(ACRES) =      12.10  AREA-AVERAGED Fm(INCH/HR)=  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap = 0.544
 PEAK FLOW RATE(CFS)    =      37.61

** PEAK FLOW RATE TABLE **
 STREAM       Q      Tc    Intensity   Fp(Fm)      Ap      Ae      HEADWATER
 NUMBER     (CFS)  (MIN.)  (INCH/HR)  (INCH/HR)            (ACRES)    NODE
    1       37.61  13.15     3.555  0.21( 0.12) 0.54       12.1        1.00
    2       36.91  14.04     3.425  0.21( 0.12) 0.54       12.3       10.00
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```



VICINITY MAP



LEGEND

- MAJOR DRAINAGE BOUNDARY
- MINOR DRAINAGE BOUNDARY
- 25 — NODE NUMBER
- A / 1.23 — AREA DESIGNATION / AREA ACREAGE (IN ACRES)
- ΣQ25 =2.4cfs / t=12.9 — PEAK CONFLUENCE FLOW RATE / TIME OF CONCENTRATION
- FLOW LINE
- PROPOSED STORM DRAIN
- SOIL GROUP

PREPARED BY:

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PROPOSED HYDROLOGY MAP

TT# 15594

JUL 22 2011

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AUG 09 2011

SECTION 4

BASIN ROUTING ANALYSIS

12" PIPE W/6" DEPTH CAPACITY

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00100	ft/ft
Normal Depth	0.50	ft
Diameter	1.00	ft

Results

Discharge	0.56	ft^3/s
Flow Area	0.39	ft^2
Wetted Perimeter	1.57	ft
Top Width	1.00	ft
Critical Depth	0.31	ft
Percent Full	50.0	%
Critical Slope	0.00563	ft/ft
Velocity	1.43	ft/s
Velocity Head	0.03	ft
Specific Energy	0.53	ft
Froude Number	0.40	
Maximum Discharge	1.21	ft^3/s
Discharge Full	1.13	ft^3/s
Slope Full	0.00025	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	50.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s

12" PIPE W/6" DEPTH CAPACITY

GVF Output Data

Normal Depth	0.50	ft
Critical Depth	0.31	ft
Channel Slope	0.00100	ft/ft
Critical Slope	0.00563	ft/ft

Rating Table for 12" Circular Orifice

Project Description

Solve For	Discharge

Input Data

Headwater Elevation	1.00	ft
Centroid Elevation	0.50	ft
Tailwater Elevation	0.00	ft
Discharge Coefficient	0.60	
Diameter	1.00	ft

Headwater Elevation (ft)	Discharge (ft³/s)	Velocity (ft/s)
1.00	2.67	3.40
2.00	4.63	5.89
3.00	5.98	7.61
4.00	7.07	9.00
5.00	8.02	10.21
6.00	8.87	11.29
7.00	9.64	12.27
8.00	10.35	13.18
9.00	11.02	14.03
10.00	11.65	14.83

18' half street - 6" curb Capacity

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02610	ft/ft
Discharge	15.60	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.70
0+10	0.50
0+10	0.00
0+12	0.17
0+12	0.20
0+28	0.52

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.70)	(0+28, 0.52)	0.015

Results

Normal Depth		0.50	ft
Elevation Range	0.00 to 0.70		
Flow Area		3.10	ft²
Wetted Perimeter		17.60	ft
Top Width		17.17	ft
Normal Depth		0.50	ft
Critical Depth		0.62	ft
Critical Slope		0.00547	ft/ft
Velocity		5.03	ft/s
Velocity Head		0.39	ft
Specific Energy		0.89	ft
Froude Number		2.08	

18' half street - 6" curb Capacity

Results

Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.50	ft
Critical Depth	0.62	ft
Channel Slope	0.02610	ft/ft
Critical Slope	0.00547	ft/ft

A. 10-YEAR STORM

)SS RATE AND LOW LOSS FRACTION FOR
. RACT 15591 AT NODE 7
10-YEAR STORM

==========

*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
AND LOW LOSS FRACTION ESTIMATIONS FOR AMC II:

TOTAL 24-HOUR DURATION RAINFALL DEPTH = 3.68 (inches)

SOIL-COVER TYPE	AREA (Acres)	PERCENT OF PERVIOUS AREA	SCS CURVE NUMBER	LOSS RATE Fp(in./hr.)	YIELD
1	0.68	100.00	75.	0.250	0.389
2	1.53	100.00	81.	0.200	0.504
3	0.85	40.00	56.	0.300	0.610
4	1.44	40.00	69.	0.250	0.677
5	2.33	40.00	75.	0.200	0.717

TOTAL AREA (Acres) = 6.83

AREA-AVERAGED LOSS RATE, Fm (in./hr.) = 0.133

AREA-AVERAGED LOW LOSS FRACTION, Y = 0.385

==========

UNIT HYDROGRAPH AND BASIN ROUTING ANALYSIS
TTM 15591 FOR UPSIZING STORM DRAIN TO ACT AS DETENTION FACILITIES
10-YEAR STORM

UNIT HYDROGRAPH DEVELOPMENT

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 6.83
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.133
LOW LOSS FRACTION = 0.385
TIME OF CONCENTRATION(MIN.) = 12.70
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 10
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.34
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.72
1-HOUR POINT RAINFALL VALUE(INCHES) = 0.95
3-HOUR POINT RAINFALL VALUE(INCHES) = 1.59
6-HOUR POINT RAINFALL VALUE(INCHES) = 2.20
24-HOUR POINT RAINFALL VALUE(INCHES) = 3.68

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 1.27
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.82

****

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	5.0	10.0	15.0	20.0
0.13	0.0011	0.22 Q	.	.	.	.	
0.34	0.0049	0.22 Q	.	.	.	.	
0.55	0.0087	0.22 Q	.	.	.	.	
0.76	0.0125	0.22 Q	.	.	.	.	
0.97	0.0164	0.22 Q	.	.	.	.	
1.18	0.0203	0.22 Q	.	.	.	.	
1.40	0.0242	0.23 Q	.	.	.	.	
1.61	0.0282	0.23 Q	.	.	.	.	
1.82	0.0322	0.23 Q	.	.	.	.	
2.03	0.0363	0.23 Q	.	.	.	.	
2.24	0.0404	0.24 Q	.	.	.	.	
2.45	0.0445	0.24 Q	.	.	.	.	
2.67	0.0486	0.24 Q	.	.	.	.	
2.88	0.0528	0.24 Q	.	.	.	.	
3.09	0.0571	0.24 Q	.	.	.	.	
3.30	0.0614	0.25 Q	.	.	.	.	
3.51	0.0657	0.25 Q	.	.	.	.	
3.72	0.0701	0.25 Q	.	.	.	.	
3.94	0.0745	0.26 Q	.	.	.	.	
4.15	0.0790	0.26 Q	.	.	.	.	
4.36	0.0835	0.26 Q	.	.	.	.	
4.57	0.0881	0.26 Q	.	.	.	.	
4.78	0.0927	0.27 Q	.	.	.	.	
4.99	0.0974	0.27 Q	.	.	.	.	

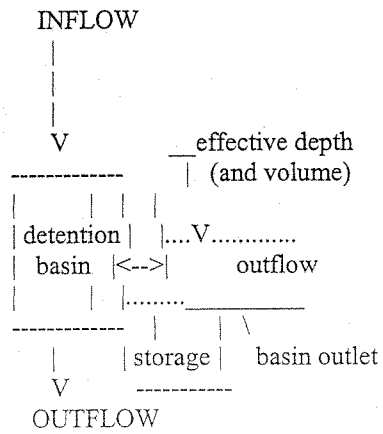
5.21	0.1022	0.27	Q	.	.	.	.
5.42	0.1070	0.28	Q	.	.	.	.
5.63	0.1118	0.28	Q	.	.	.	.
5.84	0.1168	0.28	Q	.	.	.	.
6.05	0.1217	0.29	Q	.	.	.	.
6.26	0.1268	0.29	Q	.	.	.	.
6.47	0.1319	0.30	Q	.	.	.	.
6.69	0.1371	0.30	Q	.	.	.	.
6.90	0.1424	0.30	Q	.	.	.	.
7.11	0.1477	0.31	Q	.	.	.	.
7.32	0.1531	0.31	Q	.	.	.	.
7.53	0.1586	0.32	Q	.	.	.	.
7.75	0.1642	0.32	Q	.	.	.	.
7.96	0.1699	0.33	Q	.	.	.	.
8.17	0.1757	0.33	Q	.	.	.	.
8.38	0.1815	0.34	Q	.	.	.	.
8.59	0.1875	0.35	Q	.	.	.	.
8.80	0.1936	0.35	Q	.	.	.	.
9.02	0.1997	0.36	Q	.	.	.	.
9.23	0.2060	0.36	Q	.	.	.	.
9.44	0.2125	0.37	Q	.	.	.	.
9.65	0.2190	0.38	Q	.	.	.	.
9.86	0.2257	0.39	Q	.	.	.	.
10.07	0.2325	0.39	Q	.	.	.	.
10.28	0.2395	0.40	Q	.	.	.	.
10.50	0.2466	0.41	Q	.	.	.	.
10.71	0.2539	0.42	Q	.	.	.	.
10.92	0.2614	0.43	Q	.	.	.	.
11.13	0.2691	0.45	Q	.	.	.	.
11.34	0.2770	0.45	Q	.	.	.	.
11.55	0.2851	0.47	Q	.	.	.	.
11.77	0.2934	0.48	Q	.	.	.	.
11.98	0.3020	0.50	.Q	.	.	.	.
12.19	0.3113	0.56	.Q	.	.	.	.
12.40	0.3221	0.67	.Q	.	.	.	.
12.61	0.3340	0.69	.Q	.	.	.	.
12.82	0.3463	0.72	.Q	.	.	.	.
13.04	0.3590	0.73	.Q	.	.	.	.
13.25	0.3721	0.77	.Q	.	.	.	.
13.46	0.3858	0.79	.Q	.	.	.	.
13.67	0.4001	0.84	.Q	.	.	.	.
13.88	0.4150	0.87	.Q	.	.	.	.
14.10	0.4307	0.93	.Q	.	.	.	.
14.31	0.4472	0.96	.Q	.	.	.	.
14.52	0.4649	1.05	. Q	.	.	.	.
14.73	0.4837	1.10	. Q	.	.	.	.
14.94	0.5041	1.23	. Q	.	.	.	.
15.15	0.5265	1.33	. Q	.	.	.	.
15.37	0.5530	1.71	. Q	.	.	.	.
15.58	0.5829	1.70	. Q	.	.	.	.
15.79	0.6213	2.69	. Q	.	.	.	.
16.00	0.6806	4.10	. Q	.	.	.	.
16.21	0.8369	13.77	.	.	.	Q	.	.
16.42	0.9747	1.99	. Q	.	.	.	.
16.64	1.0052	1.50	. Q	.	.	.	.
16.85	1.0284	1.16	. Q	.	.	.	.

17.06	1.0474	1.00	. Q	.	.	.	.
17.27	1.0640	0.90	.Q	.	.	.	.
17.48	1.0789	0.81	.Q	.	.	.	.
17.69	1.0926	0.75	.Q	.	.	.	.
17.91	1.1054	0.70	.Q	.	.	.	.
18.12	1.1173	0.66	.Q	.	.	.	.
18.33	1.1273	0.49	Q	.	.	.	.
18.54	1.1357	0.46	Q	.	.	.	.
18.75	1.1436	0.44	Q	.	.	.	.
18.96	1.1511	0.42	Q	.	.	.	.
19.17	1.1582	0.40	Q	.	.	.	.
19.39	1.1650	0.38	Q	.	.	.	.
19.60	1.1716	0.37	Q	.	.	.	.
19.81	1.1779	0.35	Q	.	.	.	.
20.02	1.1840	0.34	Q	.	.	.	.
20.23	1.1898	0.33	Q	.	.	.	.
20.44	1.1955	0.32	Q	.	.	.	.
20.66	1.2010	0.31	Q	.	.	.	.
20.87	1.2063	0.30	Q	.	.	.	.
21.08	1.2115	0.29	Q	.	.	.	.
21.29	1.2166	0.28	Q	.	.	.	.
21.50	1.2215	0.28	Q	.	.	.	.
21.72	1.2263	0.27	Q	.	.	.	.
21.93	1.2310	0.26	Q	.	.	.	.
22.14	1.2356	0.26	Q	.	.	.	.
22.35	1.2401	0.25	Q	.	.	.	.
22.56	1.2444	0.25	Q	.	.	.	.
22.77	1.2487	0.24	Q	.	.	.	.
22.98	1.2529	0.24	Q	.	.	.	.
23.20	1.2571	0.23	Q	.	.	.	.
23.41	1.2611	0.23	Q	.	.	.	.
23.62	1.2651	0.23	Q	.	.	.	.
23.83	1.2690	0.22	Q	.	.	.	.
24.04	1.2728	0.22	Q	.	.	.	.
24.25	1.2747	0.00	Q	.	.	.	.

BASIN ROUTING

FLOW-THROUGH DETENTION BASIN MODEL

SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
CONSTANT HYDROGRAPH TIME UNIT(MINUTES) = 12.700
DEAD STORAGE(AF) = 0.00
SPECIFIED DEAD STORAGE(AF) FILLED = 0.00
ASSUMED INITIAL DEPTH(FEET) IN STORAGE BASIN = 0.00



DEPTH-VS.-STORAGE AND DEPTH-VS.-DISCHARGE INFORMATION:
TOTAL NUMBER OF BASIN DEPTH INFORMATION ENTRIES = 12

*BASIN-DEPTH (FEET)	STORAGE (ACRE-FEET)	OUTFLOW (CFS)	**	BASIN-DEPTH (FEET)	STORAGE (ACRE-FEET)	OUTFLOW (CFS) *
* 0.000	0.000	0.000**		0.500	0.008	0.560*
* 1.000	0.023	2.670**		2.000	0.061	4.630*
* 3.000	0.106	5.980**		4.000	0.152	7.070*
* 5.000	0.189	8.020**		6.000	0.214	8.870*
* 7.000	0.214	9.640**		8.000	0.214	10.350*
* 9.000	0.214	11.020**		10.000	0.214	11.650*

BASIN STORAGE, OUTFLOW AND DEPTH ROUTING VALUES:

INTERVAL NUMBER	DEPTH (FEET)	{S-O*DT/2} (ACRE-FEET)	{S+O*DT/2} (ACRE-FEET)
1	0.00	0.00000	0.00000
2	0.50	0.00270	0.01250
3	1.00	-0.00065	0.04605
4	2.00	0.02010	.0.10110
5	3.00	0.05380	0.15840
6	4.00	0.08966	0.21334
7	5.00	0.11925	0.25955
8	6.00	0.13682	0.29198
9	7.00	0.13008	0.29872
10	8.00	0.12388	0.30493
11	9.00	0.11802	0.31079
12	10.00	0.11251	0.31630

WHERE S=STORAGE(AF);O=OUTFLOW(AF/MIN.);DT=UNIT INTERVAL(MIN.)

DETENTION BASIN ROUTING RESULTS:

NOTE: COMPUTED BASIN DEPTH, OUTFLOW, AND STORAGE QUANTITIES OCCUR AT THE GIVEN TIME. BASIN INFLOW VALUES REPRESENT THE AVERAGE INFLOW DURING THE RECENT HYDROGRAPH UNIT INTERVAL.

TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	EFFECTIVE DEPTH(FT)	OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
0.125	0.000	0.22	0.15	0.08	0.002
0.337	0.000	0.22	0.18	0.19	0.003
0.548	0.000	0.22	0.19	0.21	0.003
0.760	0.000	0.22	0.20	0.22	0.003
0.972	0.000	0.22	0.20	0.22	0.003
1.183	0.000	0.22	0.20	0.22	0.003
1.395	0.000	0.23	0.20	0.22	0.003
1.607	0.000	0.23	0.20	0.23	0.003
1.818	0.000	0.23	0.21	0.23	0.003
2.030	0.000	0.23	0.21	0.23	0.003
2.242	0.000	0.24	0.21	0.23	0.003
2.453	0.000	0.24	0.21	0.24	0.003
2.665	0.000	0.24	0.21	0.24	0.003
2.877	0.000	0.24	0.21	0.24	0.003
3.088	0.000	0.24	0.22	0.24	0.003
3.300	0.000	0.25	0.22	0.24	0.003
3.512	0.000	0.25	0.22	0.25	0.003
3.723	0.000	0.25	0.22	0.25	0.003
3.935	0.000	0.26	0.23	0.25	0.003
4.147	0.000	0.26	0.23	0.26	0.003
4.358	0.000	0.26	0.23	0.26	0.004
4.570	0.000	0.26	0.23	0.26	0.004
4.782	0.000	0.27	0.24	0.26	0.004
4.993	0.000	0.27	0.24	0.27	0.004
5.205	0.000	0.27	0.24	0.27	0.004
5.417	0.000	0.28	0.25	0.27	0.004
5.628	0.000	0.28	0.25	0.28	0.004
5.840	0.000	0.28	0.25	0.28	0.004
6.052	0.000	0.29	0.26	0.28	0.004
6.263	0.000	0.29	0.26	0.29	0.004
6.475	0.000	0.30	0.26	0.29	0.004
6.687	0.000	0.30	0.27	0.30	0.004
6.898	0.000	0.30	0.27	0.30	0.004
7.110	0.000	0.31	0.27	0.30	0.004
7.322	0.000	0.31	0.28	0.31	0.004
7.533	0.000	0.32	0.28	0.31	0.004
7.745	0.000	0.32	0.29	0.32	0.004
7.957	0.000	0.33	0.29	0.32	0.004
8.168	0.000	0.33	0.30	0.33	0.004
8.380	0.000	0.34	0.30	0.33	0.005
8.592	0.000	0.35	0.31	0.34	0.005
8.803	0.000	0.35	0.31	0.35	0.005
9.015	0.000	0.36	0.32	0.35	0.005
9.227	0.000	0.36	0.32	0.36	0.005
9.438	0.000	0.37	0.33	0.37	0.005
9.650	0.000	0.38	0.34	0.37	0.005
9.862	0.000	0.39	0.34	0.38	0.005
10.073	0.000	0.39	0.35	0.39	0.005
10.285	0.000	0.40	0.36	0.40	0.005

10.497	0.000	0.41	0.37	0.41	0.006
10.708	0.000	0.42	0.38	0.42	0.006
10.920	0.000	0.43	0.38	0.43	0.006
11.132	0.000	0.45	0.40	0.44	0.006
11.343	0.000	0.45	0.40	0.45	0.006
11.555	0.000	0.47	0.42	0.46	0.006
11.767	0.000	0.48	0.43	0.47	0.006
11.978	0.000	0.50	0.44	0.49	0.007
12.190	0.000	0.56	0.49	0.52	0.007
12.402	0.000	0.67	0.53	0.61	0.008
12.613	0.000	0.69	0.53	0.68	0.009
12.825	0.000	0.72	0.54	0.70	0.009
13.037	0.000	0.73	0.54	0.73	0.009
13.248	0.000	0.77	0.55	0.76	0.009
13.460	0.000	0.79	0.56	0.78	0.009
13.672	0.000	0.84	0.57	0.82	0.010
13.883	0.000	0.87	0.57	0.86	0.010
14.095	0.000	0.93	0.59	0.90	0.010
14.307	0.000	0.96	0.60	0.95	0.011
14.518	0.000	1.05	0.62	1.01	0.011
14.730	0.000	1.10	0.63	1.08	0.012
14.942	0.000	1.23	0.66	1.18	0.013
15.153	0.000	1.33	0.68	1.29	0.013
15.365	0.000	1.71	0.78	1.54	0.016
15.577	0.000	1.70	0.77	1.72	0.016
15.788	0.000	2.69	1.03	2.22	0.024
16.000	0.000	4.10	1.47	3.16	0.040
16.212	0.000	13.77	4.79	5.70	0.181
16.423	0.000	1.99	2.82	6.78	0.098
16.635	0.000	1.50	1.50	4.69	0.042
16.847	0.000	1.16	0.76	2.66	0.016
17.058	0.000	1.00	0.59	1.30	0.010
17.270	0.000	0.90	0.58	0.91	0.010
17.482	0.000	0.81	0.56	0.85	0.009
17.693	0.000	0.75	0.54	0.78	0.009
17.905	0.000	0.70	0.53	0.72	0.009
18.117	0.000	0.66	0.52	0.68	0.008
18.328	0.000	0.49	0.45	0.58	0.007
18.540	0.000	0.46	0.42	0.49	0.006
18.752	0.000	0.44	0.40	0.46	0.006
18.963	0.000	0.42	0.38	0.43	0.006
19.175	0.000	0.40	0.36	0.41	0.005
19.387	0.000	0.38	0.35	0.40	0.005
19.598	0.000	0.37	0.33	0.38	0.005
19.810	0.000	0.35	0.32	0.36	0.005
20.022	0.000	0.34	0.31	0.35	0.005
20.233	0.000	0.33	0.30	0.34	0.005
20.445	0.000	0.32	0.29	0.33	0.004
20.657	0.000	0.31	0.28	0.32	0.004
20.868	0.000	0.30	0.27	0.31	0.004
21.080	0.000	0.29	0.26	0.30	0.004
21.292	0.000	0.28	0.26	0.29	0.004
21.503	0.000	0.28	0.25	0.28	0.004
21.715	0.000	0.27	0.24	0.28	0.004
21.927	0.000	0.26	0.24	0.27	0.004
22.138	0.000	0.26	0.23	0.26	0.004

22.350	0.000	0.25	0.23	0.26	0.003
22.562	0.000	0.25	0.22	0.25	0.003
22.773	0.000	0.24	0.22	0.25	0.003
22.985	0.000	0.24	0.21	0.24	0.003
23.197	0.000	0.23	0.21	0.24	0.003
23.408	0.000	0.23	0.21	0.23	0.003
23.620	0.000	0.23	0.20	0.23	0.003
23.832	0.000	0.22	0.20	0.22	0.003
24.043	0.000	0.22	0.20	0.22	0.003
24.255	0.000	0.00	0.04	0.13	0.001

B. 25-YEAR STORM

OSS RATE AND LOW LOSS FRACTION FOR
. RACT 15591 AT NODE 7
25-YEAR STORM

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*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
AND LOW LOSS FRACTION ESTIMATIONS FOR AMC II:

TOTAL 24-HOUR DURATION RAINFALL DEPTH = 4.49 (inches)

SOIL-COVER TYPE	AREA (Acres)	PERCENT OF PERVIOUS AREA	SCS CURVE NUMBER	LOSS RATE Fp(in./hr.)	YIELD
1	0.68	100.00	75.	0.250	0.455
2	1.53	100.00	81.	0.200	0.566
3	0.85	40.00	56.	0.300	0.639
4	1.44	40.00	69.	0.250	0.711
5	2.33	40.00	75.	0.200	0.750

TOTAL AREA (Acres) = 6.83

AREA-AVERAGED LOSS RATE, Fm (in./hr.) = 0.133

AREA-AVERAGED LOW LOSS FRACTION, Y = 0.343

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UNIT HYDROGRAPH AND BASIN ROUTING ANALYSIS
TTM 15591 FOR UPSIZING STORM DRAIN TO ACT AS DETENTION FACILITIES
25-YEAR STORM

UNIT HYDROGRAPH DEVELOPMENT

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 6.83
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.133
LOW LOSS FRACTION = 0.343
TIME OF CONCENTRATION(MIN.) = 12.65
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 25
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.40
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.87
1-HOUR POINT RAINFALL VALUE(INCHES) = 1.15
3-HOUR POINT RAINFALL VALUE(INCHES) = 1.94
6-HOUR POINT RAINFALL VALUE(INCHES) = 2.71
24-HOUR POINT RAINFALL VALUE(INCHES) = 4.49

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 1.64
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.91

****

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	5.0	10.0	15.0	20.0
0.19	0.0021	0.28 Q	.	.	.	.	
0.40	0.0070	0.28 Q	.	.	.	.	
0.61	0.0118	0.28 Q	.	.	.	.	
0.82	0.0167	0.28 Q	.	.	.	.	
1.03	0.0217	0.29 Q	.	.	.	.	
1.24	0.0266	0.29 Q	.	.	.	.	
1.45	0.0317	0.29 Q	.	.	.	.	
1.66	0.0368	0.29 Q	.	.	.	.	
1.87	0.0419	0.30 Q	.	.	.	.	
2.09	0.0471	0.30 Q	.	.	.	.	
2.30	0.0523	0.30 Q	.	.	.	.	
2.51	0.0576	0.30 Q	.	.	.	.	
2.72	0.0629	0.31 Q	.	.	.	.	
2.93	0.0683	0.31 Q	.	.	.	.	
3.14	0.0737	0.31 Q	.	.	.	.	
3.35	0.0792	0.32 Q	.	.	.	.	
3.56	0.0847	0.32 Q	.	.	.	.	
3.77	0.0903	0.32 Q	.	.	.	.	
3.98	0.0960	0.33 Q	.	.	.	.	
4.19	0.1017	0.33 Q	.	.	.	.	
4.40	0.1075	0.34 Q	.	.	.	.	
4.62	0.1134	0.34 Q	.	.	.	.	

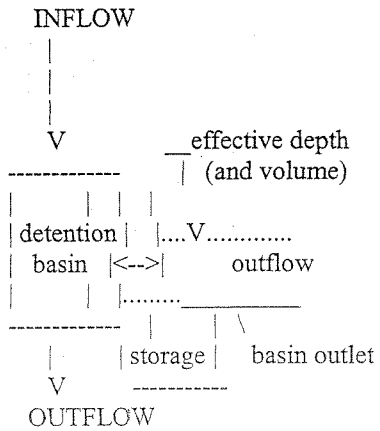
4.83	0.1193	0.34	Q	.	.	.	.	
5.04	0.1253	0.35	Q	.	.	.	.	
5.25	0.1314	0.35	Q	.	.	.	.	
5.46	0.1375	0.35	Q	.	.	.	.	
5.67	0.1438	0.36	Q	.	.	.	.	
5.88	0.1501	0.36	Q	.	.	.	.	
6.09	0.1565	0.37	Q	.	.	.	.	
6.30	0.1629	0.37	Q	.	.	.	.	
6.51	0.1695	0.38	Q	.	.	.	.	
6.72	0.1762	0.38	Q	.	.	.	.	
6.93	0.1829	0.39	Q	.	.	.	.	
7.14	0.1898	0.39	Q	.	.	.	.	
7.36	0.1967	0.40	Q	.	.	.	.	
7.57	0.2038	0.41	Q	.	.	.	.	
7.78	0.2109	0.42	Q	.	.	.	.	
7.99	0.2182	0.42	Q	.	.	.	.	
8.20	0.2256	0.43	Q	.	.	.	.	
8.41	0.2331	0.43	Q	.	.	.	.	
8.62	0.2408	0.44	Q	.	.	.	.	
8.83	0.2486	0.45	Q	.	.	.	.	
9.04	0.2565	0.46	Q	.	.	.	.	
9.25	0.2646	0.47	Q	.	.	.	.	
9.46	0.2729	0.48	Q	.	.	.	.	
9.68	0.2813	0.49	Q	.	.	.	.	
9.89	0.2899	0.50	.Q	.	.	.	.	
10.10	0.2987	0.51	.Q	.	.	.	.	
10.31	0.3076	0.52	.Q	.	.	.	.	
10.52	0.3168	0.53	.Q	.	.	.	.	
10.73	0.3262	0.55	.Q	.	.	.	.	
10.94	0.3358	0.56	.Q	.	.	.	.	
11.15	0.3457	0.58	.Q	.	.	.	.	
11.36	0.3559	0.59	.Q	.	.	.	.	
11.57	0.3663	0.61	.Q	.	.	.	.	
11.78	0.3771	0.62	.Q	.	.	.	.	
11.99	0.3882	0.65	.Q	.	.	.	.	
12.20	0.4005	0.76	.Q	.	.	.	.	
12.42	0.4150	0.91	.Q	.	.	.	.	
12.63	0.4311	0.93	.Q	.	.	.	.	
12.84	0.4477	0.97	.Q	.	.	.	.	
13.05	0.4648	0.99	.Q	.	.	.	.	
13.26	0.4825	1.04	. Q	.	.	.	.	
13.47	0.5009	1.07	. Q	.	.	.	.	
13.68	0.5201	1.13	. Q	.	.	.	.	
13.89	0.5402	1.17	. Q	.	.	.	.	
14.10	0.5611	1.24	. Q	.	.	.	.	
14.31	0.5831	1.28	. Q	.	.	.	.	
14.52	0.6064	1.39	. Q	.	.	.	.	
14.73	0.6312	1.46	. Q	.	.	.	.	
14.95	0.6584	1.66	. Q	.	.	.	.	
15.16	0.6888	1.83	. Q	.	.	.	.	
15.37	0.7248	2.30	. Q	.	.	.	.	
15.58	0.7645	2.26	. Q	.	.	.	.	
15.79	0.8147	3.51	. Q	.	.	.	.	
16.00	0.8914	5.30	. Q	.	.	.	.	
16.21	1.0824	16.62	.	.	.	. Q	.	
16.42	1.2500	2.61	. Q	.	.	.	.	

16.63	1.2904	2.04	.	Q	.	.	.
16.84	1.3215	1.54	.	Q	.	.	.
17.05	1.3465	1.33	.	Q	.	.	.
17.27	1.3686	1.21	.	Q	.	.	.
17.48	1.3887	1.10	.	Q	.	.	.
17.69	1.4071	1.02	.	Q	.	.	.
17.90	1.4243	0.95	.	Q	.	.	.
18.11	1.4404	0.90	.	Q	.	.	.
18.32	1.4537	0.64	.	Q	.	.	.
18.53	1.4645	0.60	.	Q	.	.	.
18.74	1.4746	0.57	.	Q	.	.	.
18.95	1.4843	0.54	.	Q	.	.	.
19.16	1.4934	0.51	.	Q	.	.	.
19.37	1.5022	0.49	Q		.	.	.
19.58	1.5106	0.47	Q		.	.	.
19.80	1.5187	0.46	Q		.	.	.
20.01	1.5265	0.44	Q		.	.	.
20.22	1.5341	0.42	Q		.	.	.
20.43	1.5413	0.41	Q		.	.	.
20.64	1.5484	0.40	Q		.	.	.
20.85	1.5553	0.39	Q		.	.	.
21.06	1.5619	0.38	Q		.	.	.
21.27	1.5684	0.37	Q		.	.	.
21.48	1.5747	0.36	Q		.	.	.
21.69	1.5808	0.35	Q		.	.	.
21.90	1.5868	0.34	Q		.	.	.
22.11	1.5927	0.33	Q		.	.	.
22.33	1.5984	0.33	Q		.	.	.
22.54	1.6040	0.32	Q		.	.	.
22.75	1.6095	0.31	Q		.	.	.
22.96	1.6149	0.31	Q		.	.	.
23.17	1.6202	0.30	Q		.	.	.
23.38	1.6254	0.29	Q		.	.	.
23.59	1.6304	0.29	Q		.	.	.
23.80	1.6354	0.28	Q		.	.	.
24.01	1.6403	0.28	Q		.	.	.
24.22	1.6428	0.00	Q		.	.	.

BASIN ROUTING

FLOW-THROUGH DETENTION BASIN MODEL

SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
CONSTANT HYDROGRAPH TIME UNIT(MINUTES) = 12.650
DEAD STORAGE(AF) = 0.00
SPECIFIED DEAD STORAGE(AF) FILLED = 0.00
ASSUMED INITIAL DEPTH(FEET) IN STORAGE BASIN = 0.00



DEPTH-VS.-STORAGE AND DEPTH-VS.-DISCHARGE INFORMATION:
TOTAL NUMBER OF BASIN DEPTH INFORMATION ENTRIES = 13

*BASIN-DEPTH (FEET)	STORAGE (ACRE-FEET)	OUTFLOW (CFS) **	**BASIN-DEPTH (FEET)	STORAGE (ACRE-FEET)	OUTFLOW (CFS) *
* 0.000	0.000	0.000**	0.500	0.008	0.560*
* 1.000	0.023	2.670**	2.000	0.061	4.630*
* 3.000	0.106	5.980**	4.000	0.152	7.070*
* 5.000	0.189	8.020**	6.000	0.214	8.870*
* 7.000	0.214	9.640**	8.000	0.214	10.350*
* 9.000	0.214	11.020**	10.000	0.214	11.650*
* 10.500	0.214	25.270**			

BASIN STORAGE, OUTFLOW AND DEPTH ROUTING VALUES:

INTERVAL NUMBER	DEPTH (FEET)	{S-O*DT/2} (ACRE-FEET)	{S+O*DT/2} (ACRE-FEET)
1	0.00	0.00000	0.00000
2	0.50	0.00272	0.01248
3	1.00	-0.00056	0.04596
4	2.00	0.02026	0.10094
5	3.00	0.05400	0.15820
6	4.00	0.08991	0.21309
7	5.00	0.11953	0.25927
8	6.00	0.13712	0.29168
9	7.00	0.13042	0.29839
10	8.00	0.12423	0.30457
11	9.00	0.11840	0.31041
12	10.00	0.11291	0.31590
13	10.50	-0.00575	0.43456

WHERE S=STORAGE(AF);O=OUTFLOW(AF/MIN.);DT=UNIT INTERVAL(MIN.)

DETENTION BASIN ROUTING RESULTS:
NOTE: COMPUTED BASIN DEPTH, OUTFLOW, AND STORAGE QUANTITIES OCCUR AT THE GIVEN TIME. BASIN INFLOW VALUES REPRESENT THE AVERAGE INFLOW DURING THE RECENT HYDROGRAPH UNIT INTERVAL.

TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	EFFECTIVE DEPTH(FT)	OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
0.188	0.000	0.28	0.19	0.11	0.003
0.398	0.000	0.28	0.24	0.24	0.004
0.609	0.000	0.28	0.25	0.27	0.004
0.820	0.000	0.28	0.25	0.28	0.004
1.031	0.000	0.29	0.25	0.28	0.004
1.242	0.000	0.29	0.26	0.29	0.004
1.453	0.000	0.29	0.26	0.29	0.004
1.663	0.000	0.29	0.26	0.29	0.004
1.874	0.000	0.30	0.26	0.29	0.004
2.085	0.000	0.30	0.27	0.30	0.004
2.296	0.000	0.30	0.27	0.30	0.004
2.507	0.000	0.30	0.27	0.30	0.004
2.718	0.000	0.31	0.27	0.30	0.004
2.928	0.000	0.31	0.28	0.31	0.004
3.139	0.000	0.31	0.28	0.31	0.004
3.350	0.000	0.32	0.28	0.31	0.004
3.561	0.000	0.32	0.29	0.32	0.004
3.772	0.000	0.32	0.29	0.32	0.004
3.983	0.000	0.33	0.29	0.32	0.004
4.193	0.000	0.33	0.29	0.33	0.004
4.404	0.000	0.34	0.30	0.33	0.005
4.615	0.000	0.34	0.30	0.34	0.005
4.826	0.000	0.34	0.31	0.34	0.005
5.037	0.000	0.35	0.31	0.34	0.005
5.247	0.000	0.35	0.31	0.35	0.005
5.458	0.000	0.35	0.32	0.35	0.005
5.669	0.000	0.36	0.32	0.36	0.005
5.880	0.000	0.36	0.32	0.36	0.005
6.091	0.000	0.37	0.33	0.37	0.005
6.302	0.000	0.37	0.33	0.37	0.005
6.513	0.000	0.38	0.34	0.38	0.005
6.723	0.000	0.38	0.34	0.38	0.005
6.934	0.000	0.39	0.35	0.39	0.005
7.145	0.000	0.39	0.35	0.39	0.005
7.356	0.000	0.40	0.36	0.40	0.005
7.567	0.000	0.41	0.36	0.40	0.006
7.778	0.000	0.42	0.37	0.41	0.006
7.988	0.000	0.42	0.37	0.42	0.006
8.199	0.000	0.43	0.38	0.42	0.006
8.410	0.000	0.43	0.39	0.43	0.006
8.621	0.000	0.44	0.39	0.44	0.006
8.832	0.000	0.45	0.40	0.45	0.006
9.042	0.000	0.46	0.41	0.45	0.006
9.253	0.000	0.47	0.42	0.46	0.006
9.464	0.000	0.48	0.43	0.47	0.006
9.675	0.000	0.49	0.43	0.48	0.007

9.886	0.000	0.50	0.44	0.49	0.007
10.097	0.000	0.51	0.45	0.50	0.007
10.307	0.000	0.52	0.46	0.51	0.007
10.518	0.000	0.53	0.47	0.52	0.007
10.729	0.000	0.55	0.49	0.54	0.007
10.940	0.000	0.56	0.50	0.55	0.008
11.151	0.000	0.58	0.50	0.57	0.008
11.362	0.000	0.59	0.51	0.58	0.008
11.573	0.000	0.61	0.51	0.60	0.008
11.783	0.000	0.62	0.52	0.62	0.008
11.994	0.000	0.65	0.52	0.64	0.008
12.205	0.000	0.76	0.55	0.71	0.009
12.416	0.000	0.91	0.59	0.85	0.010
12.627	0.000	0.93	0.59	0.93	0.010
12.837	0.000	0.97	0.60	0.95	0.011
13.048	0.000	0.99	0.60	0.99	0.011
13.259	0.000	1.04	0.62	1.02	0.011
13.470	0.000	1.07	0.62	1.06	0.011
13.681	0.000	1.13	0.64	1.10	0.012
13.892	0.000	1.17	0.64	1.15	0.012
14.102	0.000	1.24	0.66	1.21	0.013
14.313	0.000	1.28	0.67	1.27	0.013
14.524	0.000	1.39	0.70	1.34	0.014
14.735	0.000	1.46	0.71	1.43	0.014
14.946	0.000	1.66	0.77	1.57	0.016
15.157	0.000	1.83	0.80	1.76	0.017
15.367	0.000	2.30	0.92	2.09	0.020
15.578	0.000	2.26	0.90	2.30	0.020
15.789	0.000	3.51	1.28	2.73	0.033
16.000	0.000	5.30	1.94	3.86	0.058
16.211	0.000	16.62	8.70	7.66	0.214
16.422	0.000	2.61	3.13	8.47	0.112
16.632	0.000	2.04	1.88	5.26	0.056
16.843	0.000	1.54	0.98	3.49	0.022
17.054	0.000	1.33	0.66	1.91	0.012
17.265	0.000	1.21	0.65	1.22	0.012
17.476	0.000	1.10	0.63	1.15	0.011
17.687	0.000	1.02	0.61	1.05	0.011
17.897	0.000	0.95	0.59	0.98	0.010
18.108	0.000	0.90	0.58	0.92	0.010
18.319	0.000	0.64	0.51	0.75	0.008
18.530	0.000	0.60	0.51	0.60	0.008
18.741	0.000	0.57	0.50	0.58	0.008
18.952	0.000	0.54	0.49	0.55	0.007
19.163	0.000	0.51	0.47	0.53	0.007
19.373	0.000	0.49	0.45	0.51	0.007
19.584	0.000	0.47	0.43	0.49	0.007
19.795	0.000	0.46	0.41	0.47	0.006
20.006	0.000	0.44	0.40	0.45	0.006
20.217	0.000	0.42	0.38	0.44	0.006
20.427	0.000	0.41	0.37	0.42	0.006
20.638	0.000	0.40	0.36	0.41	0.005
20.849	0.000	0.39	0.35	0.40	0.005
21.060	0.000	0.38	0.34	0.39	0.005
21.271	0.000	0.37	0.33	0.37	0.005
21.482	0.000	0.36	0.32	0.36	0.005

21.693	0.000	0.35	0.31	0.36	0.005
21.903	0.000	0.34	0.31	0.35	0.005
22.114	0.000	0.33	0.30	0.34	0.005
22.325	0.000	0.33	0.29	0.33	0.004
22.536	0.000	0.32	0.29	0.32	0.004
22.747	0.000	0.31	0.28	0.32	0.004
22.957	0.000	0.31	0.27	0.31	0.004
23.168	0.000	0.30	0.27	0.30	0.004
23.379	0.000	0.29	0.26	0.30	0.004
23.590	0.000	0.29	0.26	0.29	0.004
23.801	0.000	0.28	0.25	0.29	0.004
24.012	0.000	0.28	0.25	0.28	0.004
24.222	0.000	0.00	0.05	0.17	0.001

C. 100-YEAR STORM

)SS RATE AND LOW LOSS FRACTION FOR
. RACT 15591 AT NODE 7
100-YEAR STORM

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*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
AND LOW LOSS FRACTION ESTIMATIONS FOR AMC III:

TOTAL 24-HOUR DURATION RAINFALL DEPTH = 5.63 (inches)

SOIL-COVER TYPE	AREA (Acres)	PERCENT OF PERVIOUS AREA	SCS CURVE NUMBER	LOSS RATE Fp(in./hr.)	YIELD
1	0.68	100.00	75.(AMC II)	0.250	0.816
2	1.53	100.00	81.(AMC II)	0.200	0.896
3	0.85	40.00	56.(AMC II)	0.300	0.792
4	1.44	40.00	69.(AMC II)	0.250	0.863
5	2.33	40.00	75.(AMC II)	0.200	0.901

TOTAL AREA (Acres) = 6.83

AREA-AVERAGED LOSS RATE, Fm (in./hr.) = 0.133

AREA-AVERAGED LOW LOSS FRACTION, Y = 0.130

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UNIT HYDROGRAPH AND BASIN ROUTING ANALYSIS
TTM 15591 FOR UPSIZING STORM DRAIN TO ACT AS DETENTION FACILITIES
100-YEAR STORM

UNIT HYDROGRAPH DEVELOPMENT

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 6.83
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.133
LOW LOSS FRACTION = 0.130
TIME OF CONCENTRATION(MIN.) = 12.59
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 100
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.52
30-MINUTE POINT RAINFALL VALUE(INCHES) = 1.09
1-HOUR POINT RAINFALL VALUE(INCHES) = 1.45
3-HOUR POINT RAINFALL VALUE(INCHES) = 2.43
6-HOUR POINT RAINFALL VALUE(INCHES) = 3.36
24-HOUR POINT RAINFALL VALUE(INCHES) = 5.63

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 2.55
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.66

****

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	7.5	15.0	22.5	30.0
0.05	0.0000	0.00 Q	.	.	.	.	
0.26	0.0041	0.47 Q	.	.	.	.	
0.47	0.0123	0.47 Q	.	.	.	.	
0.68	0.0206	0.48 Q	.	.	.	.	
0.89	0.0289	0.48 Q	.	.	.	.	
1.10	0.0373	0.49 Q	.	.	.	.	
1.31	0.0458	0.49 Q	.	.	.	.	
1.52	0.0544	0.50 Q	.	.	.	.	
1.73	0.0631	0.50 Q	.	.	.	.	
1.94	0.0718	0.51 Q	.	.	.	.	
2.15	0.0806	0.51 Q	.	.	.	.	
2.36	0.0895	0.52 Q	.	.	.	.	
2.57	0.0985	0.52 Q	.	.	.	.	
2.78	0.1075	0.53 Q	.	.	.	.	
2.99	0.1167	0.53 Q	.	.	.	.	
3.20	0.1259	0.54 Q	.	.	.	.	
3.41	0.1352	0.54 Q	.	.	.	.	
3.62	0.1447	0.55 Q	.	.	.	.	
3.83	0.1542	0.55 Q	.	.	.	.	
4.04	0.1639	0.56 Q	.	.	.	.	
4.25	0.1736	0.56 Q	.	.	.	.	
4.46	0.1834	0.57 Q	.	.	.	.	
4.67	0.1934	0.58 Q	.	.	.	.	
4.88	0.2035	0.59 Q	.	.	.	.	

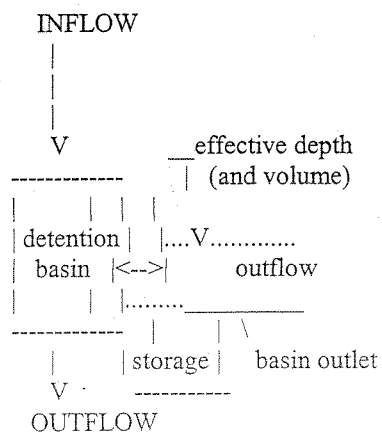
5.09	0.2137	0.59	Q	.	.	.	.	
5.30	0.2240	0.60	Q	.	.	.	.	
5.51	0.2344	0.60	Q	.	.	.	.	
5.72	0.2450	0.61	Q	.	.	.	.	
5.93	0.2557	0.62	Q	.	.	.	.	
6.14	0.2666	0.63	Q	.	.	.	.	
6.35	0.2776	0.64	Q	.	.	.	.	
6.56	0.2887	0.65	Q	.	.	.	.	
6.77	0.3000	0.65	Q	.	.	.	.	
6.98	0.3114	0.67	Q	.	.	.	.	
7.19	0.3230	0.67	Q	.	.	.	.	
7.40	0.3348	0.69	Q	.	.	.	.	
7.61	0.3468	0.69	Q	.	.	.	.	
7.82	0.3589	0.71	Q	.	.	.	.	
8.03	0.3713	0.72	Q	.	.	.	.	
8.24	0.3838	0.73	Q	.	.	.	.	
8.45	0.3966	0.74	Q	.	.	.	.	
8.66	0.4096	0.76	.Q	.	.	.	.	
8.87	0.4228	0.77	.Q	.	.	.	.	
9.08	0.4362	0.78	.Q	.	.	.	.	
9.29	0.4499	0.79	.Q	.	.	.	.	
9.50	0.4639	0.82	.Q	.	.	.	.	
9.70	0.4781	0.83	.Q	.	.	.	.	
9.91	0.4926	0.85	.Q	.	.	.	.	
10.12	0.5075	0.86	.Q	.	.	.	.	
10.33	0.5226	0.89	.Q	.	.	.	.	
10.54	0.5381	0.90	.Q	.	.	.	.	
10.75	0.5540	0.93	.Q	.	.	.	.	
10.96	0.5703	0.95	.Q	.	.	.	.	
11.17	0.5870	0.98	.Q	.	.	.	.	
11.38	0.6041	1.00	.Q	.	.	.	.	
11.59	0.6217	1.03	.Q	.	.	.	.	
11.80	0.6398	1.06	.Q	.	.	.	.	
12.01	0.6585	1.10	.Q	.	.	.	.	
12.22	0.6793	1.29	.Q	.	.	.	.	
12.43	0.7032	1.47	.Q	.	.	.	.	
12.64	0.7289	1.50	.Q	.	.	.	.	
12.85	0.7554	1.56	. Q	.	.	.	.	
13.06	0.7828	1.60	. Q	.	.	.	.	
13.27	0.8113	1.68	. Q	.	.	.	.	
13.48	0.8408	1.73	. Q	.	.	.	.	
13.69	0.8717	1.83	. Q	.	.	.	.	
13.90	0.9039	1.89	. Q	.	.	.	.	
14.11	0.9378	2.02	. Q	.	.	.	.	
14.32	0.9737	2.11	. Q	.	.	.	.	
14.53	1.0119	2.30	. Q	.	.	.	.	
14.74	1.0527	2.41	. Q	.	.	.	.	
14.95	1.0970	2.70	. Q	.	.	.	.	
15.16	1.1454	2.88	. Q	.	.	.	.	
15.37	1.1999	3.40	. Q	.	.	.	.	
15.58	1.2592	3.43	. Q	.	.	.	.	
15.79	1.3299	4.73	. Q	.	.	.	.	
16.00	1.4283	6.61	. Q	.	.	.	.	
16.21	1.6730	21.61	.	.	.	Q	.	.
16.42	1.8939	3.86	. Q	.	.	.	.	
16.63	1.9543	3.11	. Q	.	.	.	.	

16.84	2.0034	2.54	. Q	.	.	.	.
17.05	2.0445	2.20	. Q	.	.	.	.
17.26	2.0805	1.95	. Q	.	.	.	.
17.47	2.1128	1.78	. Q	.	.	.	.
17.68	2.1424	1.64	. Q	.	.	.	.
17.89	2.1698	1.53	. Q	.	.	.	.
18.10	2.1956	1.44	.Q	.	.	.	.
18.31	2.2174	1.08	.Q	.	.	.	.
18.52	2.2355	1.02	.Q	.	.	.	.
18.73	2.2526	0.96	.Q	.	.	.	.
18.94	2.2689	0.92	.Q	.	.	.	.
19.15	2.2844	0.87	.Q	.	.	.	.
19.36	2.2993	0.84	.Q	.	.	.	.
19.57	2.3135	0.80	.Q	.	.	.	.
19.78	2.3272	0.78	.Q	.	.	.	.
19.99	2.3404	0.75	Q	.	.	.	.
20.20	2.3532	0.72	Q	.	.	.	.
20.41	2.3655	0.70	Q	.	.	.	.
20.62	2.3775	0.68	Q	.	.	.	.
20.83	2.3891	0.66	Q	.	.	.	.
21.04	2.4004	0.64	Q	.	.	.	.
21.25	2.4114	0.63	Q	.	.	.	.
21.46	2.4221	0.61	Q	.	.	.	.
21.67	2.4325	0.59	Q	.	.	.	.
21.88	2.4427	0.58	Q	.	.	.	.
22.09	2.4527	0.57	Q	.	.	.	.
22.30	2.4625	0.56	Q	.	.	.	.
22.50	2.4720	0.54	Q	.	.	.	.
22.71	2.4813	0.53	Q	.	.	.	.
22.92	2.4905	0.52	Q	.	.	.	.
23.13	2.4995	0.51	Q	.	.	.	.
23.34	2.5083	0.50	Q	.	.	.	.
23.55	2.5169	0.49	Q	.	.	.	.
23.76	2.5254	0.49	Q	.	.	.	.
23.97	2.5338	0.48	Q	.	.	.	.
24.18	2.5420	0.47	Q	.	.	.	.
24.39	2.5460	0.00	Q	.	.	.	.

BASIN ROUTING

FLOW-THROUGH DETENTION BASIN MODEL

SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
CONSTANT HYDROGRAPH TIME UNIT(MINUTES) = 12.590
DEAD STORAGE(AF) = 0.00
SPECIFIED DEAD STORAGE(AF) FILLED = 0.00
ASSUMED INITIAL DEPTH(FEET) IN STORAGE BASIN = 0.00



DEPTH-VS.-STORAGE AND DEPTH-VS.-DISCHARGE INFORMATION:
TOTAL NUMBER OF BASIN DEPTH INFORMATION ENTRIES = 13

*BASIN-DEPTH (FEET)	STORAGE (ACRE-FEET)	OUTFLOW (CFS)	**	BASIN-DEPTH (FEET)	STORAGE (ACRE-FEET)	OUTFLOW (CFS) *
* 0.000	0.000	0.000**		0.500	0.008	0.560*
* 1.000	0.023	2.670**		2.000	0.061	4.630*
* 3.000	0.106	5.980**		4.000	0.152	7.070*
* 5.000	0.189	8.020**		6.000	0.214	8.870*
* 7.000	0.214	9.640**		8.000	0.214	10.350*
* 9.000	0.214	11.020**		10.000	0.214	11.650*
* 10.500	0.214	25.270**				

BASIN STORAGE, OUTFLOW AND DEPTH ROUTING VALUES:

INTERVAL NUMBER	DEPTH (FEET)	{S-O*DT/2} (ACRE-FEET)	{S+O*DT/2} (ACRE-FEET)
1	0.00	0.00000	0.00000
2	0.50	0.00274	0.01246
3	1.00	-0.00045	0.04585
4	2.00	0.02045	0.10075
5	3.00	0.05425	0.15795
6	4.00	0.09020	0.21280
7	5.00	0.11986	0.25894
8	6.00	0.13749	0.29131
9	7.00	0.13081	0.29799
10	8.00	0.12466	0.30414
11	9.00	0.11885	0.30996
12	10.00	0.11339	0.31542

13 10.50 -0.00471 0.43352
WHERE S=STORAGE(AF);O=OUTFLOW(AF/MIN.);DT=UNIT INTERVAL(MIN.)

DETENTION BASIN ROUTING RESULTS:
NOTE: COMPUTED BASIN DEPTH, OUTFLOW, AND STORAGE QUANTITIES OCCUR AT THE GIVEN TIME. BASIN INFLOW VALUES REPRESENT THE AVERAGE INFLOW DURING THE RECENT HYDROGRAPH UNIT INTERVAL.

TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	EFFECTIVE DEPTH(FT)	OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
0.053	0.000	0.00	0.00	0.00	0.000
0.262	0.000	0.47	0.33	0.18	0.005
0.472	0.000	0.47	0.40	0.41	0.006
0.682	0.000	0.48	0.42	0.46	0.006
0.892	0.000	0.48	0.43	0.48	0.007
1.102	0.000	0.49	0.43	0.48	0.007
1.312	0.000	0.49	0.44	0.49	0.007
1.521	0.000	0.50	0.44	0.49	0.007
1.731	0.000	0.50	0.45	0.50	0.007
1.941	0.000	0.51	0.45	0.50	0.007
2.151	0.000	0.51	0.45	0.51	0.007
2.361	0.000	0.52	0.46	0.51	0.007
2.571	0.000	0.52	0.46	0.52	0.007
2.780	0.000	0.53	0.47	0.52	0.007
2.990	0.000	0.53	0.47	0.53	0.007
3.200	0.000	0.54	0.48	0.53	0.007
3.410	0.000	0.54	0.48	0.54	0.007
3.620	0.000	0.55	0.49	0.54	0.007
3.830	0.000	0.55	0.49	0.55	0.007
4.039	0.000	0.56	0.50	0.55	0.008
4.249	0.000	0.56	0.50	0.56	0.008
4.459	0.000	0.57	0.50	0.57	0.008
4.669	0.000	0.58	0.50	0.58	0.008
4.879	0.000	0.59	0.51	0.58	0.008
5.089	0.000	0.59	0.51	0.59	0.008
5.299	0.000	0.60	0.51	0.60	0.008
5.508	0.000	0.60	0.51	0.60	0.008
5.718	0.000	0.61	0.51	0.61	0.008
5.928	0.000	0.62	0.51	0.62	0.008
6.138	0.000	0.63	0.52	0.63	0.008
6.348	0.000	0.64	0.52	0.63	0.008
6.557	0.000	0.65	0.52	0.64	0.008
6.767	0.000	0.65	0.52	0.65	0.008
6.977	0.000	0.67	0.53	0.66	0.008
7.187	0.000	0.67	0.53	0.67	0.008
7.397	0.000	0.69	0.53	0.68	0.009
7.607	0.000	0.69	0.53	0.69	0.009
7.816	0.000	0.71	0.54	0.70	0.009
8.026	0.000	0.72	0.54	0.71	0.009
8.236	0.000	0.73	0.54	0.72	0.009
8.446	0.000	0.74	0.54	0.74	0.009
8.656	0.000	0.76	0.55	0.75	0.009
8.866	0.000	0.77	0.55	0.76	0.009
9.075	0.000	0.78	0.55	0.78	0.009
9.285	0.000	0.79	0.56	0.79	0.009

9.495	0.000	0.82	0.56	0.81	0.009
9.705	0.000	0.83	0.56	0.82	0.010
9.915	0.000	0.85	0.57	0.84	0.010
10.125	0.000	0.86	0.57	0.86	0.010
10.335	0.000	0.89	0.58	0.88	0.010
10.544	0.000	0.90	0.58	0.90	0.010
10.754	0.000	0.93	0.59	0.92	0.010
10.964	0.000	0.95	0.59	0.94	0.010
11.174	0.000	0.98	0.60	0.96	0.011
11.384	0.000	1.00	0.60	0.99	0.011
11.594	0.000	1.03	0.61	1.02	0.011
11.803	0.000	1.06	0.62	1.05	0.011
12.013	0.000	1.10	0.63	1.08	0.011
12.223	0.000	1.29	0.68	1.21	0.013
12.433	0.000	1.47	0.72	1.40	0.014
12.643	0.000	1.50	0.72	1.49	0.014
12.852	0.000	1.56	0.74	1.53	0.015
13.062	0.000	1.60	0.75	1.59	0.015
13.272	0.000	1.68	0.77	1.65	0.016
13.482	0.000	1.73	0.78	1.71	0.016
13.692	0.000	1.83	0.80	1.78	0.017
13.902	0.000	1.89	0.82	1.86	0.017
14.111	0.000	2.02	0.85	1.96	0.018
14.321	0.000	2.11	0.87	2.08	0.019
14.531	0.000	2.30	0.92	2.22	0.020
14.741	0.000	2.41	0.94	2.37	0.021
14.951	0.000	2.70	1.02	2.56	0.023
15.161	0.000	2.88	1.08	2.76	0.026
15.370	0.000	3.40	1.26	3.00	0.033
15.580	0.000	3.43	1.34	3.26	0.036
15.790	0.000	4.73	1.78	3.77	0.052
16.000	0.000	6.61	2.52	4.77	0.084
16.210	0.000	21.61	10.41	14.11	0.214
16.420	0.000	3.86	1.68	13.44	0.048
16.629	0.000	3.11	1.40	3.72	0.038
16.839	0.000	2.54	1.11	3.17	0.027
17.049	0.000	2.20	0.91	2.59	0.020
17.259	0.000	1.95	0.82	2.11	0.017
17.469	0.000	1.78	0.78	1.84	0.016
17.679	0.000	1.64	0.75	1.69	0.015
17.889	0.000	1.53	0.73	1.57	0.014
18.098	0.000	1.44	0.71	1.47	0.014
18.308	0.000	1.08	0.61	1.24	0.011
18.518	0.000	1.02	0.61	1.03	0.011
18.728	0.000	0.96	0.59	0.98	0.010
18.938	0.000	0.92	0.58	0.93	0.010
19.147	0.000	0.87	0.57	0.89	0.010
19.357	0.000	0.84	0.57	0.85	0.010
19.567	0.000	0.80	0.56	0.82	0.009
19.777	0.000	0.78	0.55	0.79	0.009
19.987	0.000	0.75	0.54	0.76	0.009
20.197	0.000	0.72	0.54	0.73	0.009
20.406	0.000	0.70	0.53	0.71	0.009
20.616	0.000	0.68	0.53	0.69	0.008
20.826	0.000	0.66	0.52	0.67	0.008
21.036	0.000	0.64	0.52	0.65	0.008

21.246	0.000	0.63	0.52	0.63	0.008
21.456	0.000	0.61	0.51	0.62	0.008
21.666	0.000	0.59	0.51	0.60	0.008
21.875	0.000	0.58	0.50	0.59	0.008
22.085	0.000	0.57	0.50	0.57	0.008
22.295	0.000	0.56	0.50	0.56	0.008
22.505	0.000	0.54	0.49	0.55	0.007
22.715	0.000	0.53	0.48	0.54	0.007
22.924	0.000	0.52	0.47	0.53	0.007
23.134	0.000	0.51	0.46	0.52	0.007
23.344	0.000	0.50	0.45	0.51	0.007
23.554	0.000	0.49	0.44	0.50	0.007
23.764	0.000	0.49	0.44	0.49	0.007
23.974	0.000	0.48	0.43	0.48	0.007
24.184	0.000	0.47	0.42	0.48	0.006
24.393	0.000	0.00	0.09	0.29	0.001

SECTION 5

REFERENCES

A. TRACT 10931 STORM DRAIN IMPROVEMENT PLANS

IMPROVEMENT PLANS
FOR
SERRANO HIGHLANDS
TRACT NO. 10931 & 12304

(PORTION OF TENT. TRACT NO. 10931)

... DEVELOPER SHALL MEAN THE SUBDIVISION DEVELOPER, PERMITTEE, OR SHALL MEAN CONTRACTOR IN THE CASE OF A PUBLIC WORKS CONTRACT WITH THE COUNTY OF ORANGE. BUILDING OFFICIAL SHALL MEAN THE DIRECTOR, EMA, OR HIS AUTHORIZED AGENT ACTING WITHIN THE SCOPE OF HIS AUTHORITY.

THE DEVELOPER SHALL OBTAIN AN ENCROACHMENT PERMIT FROM EMA, REGULATION, PRIOR TO INSTALLATION OF STREET IMPROVEMENTS, UTILITIES, OR OTHER ITEMS NOT SHOWN ON PLANS APPROVED BY EMA, DEVELOPMENT. TELEPHONE ... DEVELOPMENT AT (714) 834-3488.

THE DEVELOPER SHALL TELEPHONE EMA, DEVELOPMENT AT LEAST 24 HOURS PRIOR TO STARTING CONSTRUCTION WORK SUBJECT TO EMA, DEVELOPMENT INSPECTION. THE DEVELOPER SHALL TELEPHONE EMA, REGULATION AT LEAST 48 HOURS PRIOR TO STARTING GRADING OR BRUSHING WORK SUBJECT TO A GRADING PERMIT.

ALL UNDERGROUND UTILITIES SHALL BE INSTALLED PRIOR TO SURFACING OF STREETS. THE INSTALLATION OF ALL UNDERGROUND FACILITIES CROSSING EXISTING ARTERIAL HIGHWAYS REQUIRES BORING OR JACKING, UNLESS OTHERWISE APPROVED BY THE ASSISTANT DIRECTOR, EMA DEVELOPMENT.

MAILBOXES SHALL BE INSTALLED IN LOCATIONS APPROVED BY THE LOCAL POSTMASTER PER EMA STANDARD PLANS.

CORRESPONDING STATE OF CALIFORNIA TEST METHODS MAY BE SUBSTITUTED FOR DESIGNATED ASTM TEST METHODS FOR WORK SUBJECT TO EMA, DEVELOPMENT INSPECTION EXCEPT AS NOTED IN NO. 9.

LABORATORY MAXIMUM DENSITY TEST FOR WORK SUBJECT TO EMA, DEVELOPMENT INSPECTION SHALL BE PER METHOD 2 OF SECTION 211-2.1. THE CORRECTION FOR OVERSIZE MATERIAL AS STATED IN TEST METHOD NO. CALIFORNIA 216 SHALL BE REPLACED WITH NOTE 2 OF ASTM D1557. LABORATORY MAXIMUM DENSITY TESTS FOR WORK UNDER A GRADING PERMIT SHALL CONFORM TO THE REQUIREMENTS OF THE GRADING AND EXCAVATION CODE.

STRUCTURAL SECTION REQUIREMENTS FOR PRIVATE AND PUBLIC ROADS CREATED BY A TENTATIVE TRACT MAP OR PARCEL MAP SHALL BE DETERMINED BY EMA'S MATERIALS ENGINEER. SUBGRADE COMPACTION REQUIREMENTS RECOMMENDED BY THE PROJECT SOILS ENGINEER MAY BE MODIFIED BY THE EMA'S MATERIAL ENGINEER WHEN NECESSARY FOR STRUCTURAL SECTION DESIGN. STRUCTURAL SECTION REQUIREMENTS FOR COMMERCIAL OR INDUSTRIAL DRIVEWAYS AND PARKING AREAS SUBJECT TO THE INSPECTION OF EMA REGULATION SHALL BE APPROVED IN ACCORDANCE WITH THE REQUIREMENTS OF THE GRADING AND EXCAVATION CODE.

11. DRIVEWAY DEPRESSIONS ARE MADE IN ANY CURB, DRIVEWAY APPROACHES ARE THEN CONSIDERED TO BE PART OF THE IMPROVEMENT PLAN AND SHALL BE CONSTRUCTED IN ACCORDANCE WITH EMA STANDARD PLANS.

12. MONUMENTS ARE TO BE SET PER THE REQUIREMENTS OF THE SUBDIVISION MAP ACT, LAND SURVEYORS ACT, AND COUNTY SUBDIVISION CODE AND IN ACCORDANCE WITH THE RULES AND PROCEDURES APPROVED BY THE COUNTY SURVEYOR. ALL LOT CORNERS AND TRACT BOUNDARIES SHALL BE LOCATED AND MONUMENTED IN ACCORDANCE WITH THE RECORDED TRACT MAP AND A WRITTEN CONFIRMATION TO THAT EFFECT SHALL BE SUBMITTED TO THE BUILDING OFFICIAL BY THE PROJECT CIVIL ENGINEER. IN CASES WHERE BUILDINGS OR STRUCTURES ARE BUILT UPON PROPERTY LINES, AND MARKERS NEED NOT BE SET, THE PROJECT CIVIL ENGINEER SHALL PROVIDE WRITTEN EVIDENCE TO THE BUILDING OFFICIAL THAT THE BUILDINGS ARE LOCATED IN COMPLIANCE WITH THE APPROVED PLOT PLAN.

13. TREES SHALL NOT BE PLANTED IN ORANGE COUNTY RIGHT OF WAY UNLESS A PERMIT HAS BEEN OBTAINED FROM EMA, REGULATION, OR ARE PLANTED IN ACCORDANCE WITH A LANDSCAPE PLAN APPROVED BY THE ASSISTANT DIRECTOR, DEVELOPMENT. SEE STANDARD PLAN 117 FOR LOCATION RESTRICTIONS AT INTERSECTIONS.

14. ADVERTISING SIGNS WILL NOT BE PERMITTED WITHIN STREET RIGHT OF WAY PER ORANGE COUNTY CODIFIED ORDINANCE 6-1-69.

15. JOINS BETWEEN NEW PAVEMENT AND EXISTING PAVEMENT SHALL BE MADE BY SAW CUTTING EXISTING PAVEMENT TO EFFECT A NEAT JOIN OR BY FEATHERING NEW ASPHALT CONCRETE OVER EXISTING, ALL AS DIRECTED BY THE ENGINEER.

16. DEVELOPER SHALL MAINTAIN ADJACENT STREETS IN A NEAT, SAFE, CLEAN AND SANITARY CONDITION AT ALL TIMES AND TO THE SATISFACTION OF COUNTY'S INSPECTOR. THE ADJACENT STREETS SHALL BE KEPT CLEAN OF DEBRIS, WITH DUST AND OTHER NUISANCE BEING CONTROLLED AT ALL TIMES. DEVELOPER SHALL BE RESPONSIBLE FOR ANY CLEAN UP ON ADJACENT STREETS AFFECTED BY HIS CONSTRUCTION. METHOD OF STREET CLEANING SHALL BE DRY SWEEPING OF ALL PAVED AREA.

17. PRIOR TO FINAL ACCEPTANCE OF STREET IMPROVEMENTS, ALL STREET STRIPING AND STENCILING WITHIN THE PERIMETER OF THE CONSTRUCTION PROJECT WILL BE RESTORED TO A "LIKE NEW" CONDITION IN A MANNER MEETING THE APPROVAL OF THE ASSISTANT DIRECTOR, EMA/DEVELOPMENT.

18. ALL CONCRETE SIDEWALKS OR CURBS SHALL BE SAW-CUT TO THE NEAREST TRANSVERSE SCORE MARK OR ADJUSTABLE CONTROL JOINT OR WEAKENED PLANE JOINT AND REPLACED IN CONFORMANCE WITH THE APPLICABLE PROVISIONS OF THE ORANGE COUNTY ... PLANS AND STANDARD SPECIFICATIONS.

SEWER NOTES

1. ALL SANITARY SEWER WORK SHALL CONFORM TO THE "STANDARD SPECIFICATIONS FOR THE CONSTRUCTION OF SEWERS" OF THE LOS ALISOS WATER DISTRICT. THE CONTRACTOR SHALL KEEP A COPY OF THE STANDARD SPECIFICATIONS AND DRAWINGS ON THE JOB SITE AT ALL TIMES.

2. FOUR COPIES OF APPROVED CONSTRUCTION PLANS SHALL BE FURNISHED TO THE DISTRICT ENGINEER'S OFFICE PRIOR TO BEGINNING CONSTRUCTION.

3. THE DISTRICT INSPECTOR SHALL BE NOTIFIED AT LEAST TWO WORKING DAYS PRIOR TO ANY INSPECTION. CALL (714) 830-0580

4. FOUR-INCH, INTERNAL DIAMETER, VCP HOUSE CONNECTIONS ARE TO BE CONSTRUCTED FROM THE SEWER MAIN LINE TO THE PROPERTY LINE FOR EACH LOT OR AS SHOWN ON THE PLANS

5. ALL SEWER MAINS, HOUSE CONNECTIONS, AND APPURTENANCES SHALL BE CONSTRUCTED PRIOR TO PAVING OF THE STREET.

6. SEWER LENGTHS ARE CALCULATED ON HORIZONTAL DISTANCES

7. VCP STUBS AND THE FIRST TWO JOINTS OUT OF ALL MANHOLES SHALL BE ONE FOOT MAXIMUM MEASURED FROM THE INSIDE WALL OF THE MANHOLE

8. THE SURVEYOR SHALL STAKE THE LOCATION OF ALL WYE FITTINGS. ALL HOUSE LATERALS NOT NORMAL TO STREET SEWERS SHALL HAVE END OF LATERAL AT PROPERTY LINE STAKED AND TIED TO A PROPERTY LINE AS SHOWN ON THE PLANS

9. IT SHALL BE THE RESPONSIBILITY OF THE SEWER CONTRACTOR TO EXPOSE ALL JOINT POINTS TO EXISTING LINES AND TO HAVE THE LOCATION AND ELEVATION VERIFIED BY THE DISTRICT ENGINEER PRIOR TO ANY SEWER STAKES BEING FURNISHED

10. THE LOS ALISOS WATER DISTRICT WILL INSPECT ALL MAIN LINE SEWERS. THE ORANGE COUNTY BUILDING AND SAFETY DEPARTMENT WILL INSPECT AND CERTIFY ALL HOUSE LATERALS. A MINIMUM OF 10 FEET 4 INCHES OF HOUSE LATERAL SHALL BE INSTALLED AND INSPECTED BY THE ORANGE COUNTY BUILDING AND SAFETY DEPARTMENT AND TESTED JOINTLY WITH THE MAIN LINE UNDER THE JURISDICTION OF THE LOS ALISOS WATER DISTRICT

11. IN ORDER TO PREVENT ACCIDENTAL USE OF THE NEW SEWER PRIOR TO COMPLETION AND ACCEPTANCE, THE INLET OF THE DOWNSTREAM EXISTING MANHOLE SHOULD BE PLUGGED WITH BRICK AND MORTAR

12. NO FACILITY SHALL BE BACKFILLED UNTIL INSPECTED BY THE LOS ALISOS WATER DISTRICT

13. SEWER MAIN OWNERSHIP - UPON COMPLETION OF ALL TESTS AND ACCEPTANCE BY THE DEVELOPER, OPERATION AND MAINTENANCE SHALL BE THE RESPONSIBILITY OF LOS ALISOS WATER DISTRICT

14. SEWER LATERAL OWNERSHIP - UPON COMPLETION OF ALL TESTS AND ACCEPTANCE BY THE ORANGE COUNTY BUILDING DEPARTMENT, OPERATION AND MAINTENANCE SHALL NOT BE THE RESPONSIBILITY OF LOS ALISOS WATER DISTRICT

15. PROVIDE A CLEANOUT STUB OUTSIDE OF THE HOUSE OR GARAGE AND IDENTIFY WITH A LANDMARK TO FACILITATE SEWER HOUSE LATERALS AND MAIN LINE CLEANING.

16. ALL SEWER HOUSE LATERALS ARE TO BE LOCATED WITH A LETTER "S" CHISELED IN CURB FACE PER LOS ALISOS WATER DISTRICT SPECIFICATIONS.

17. THE SEWER IMPROVEMENTS AND SEWER SYSTEM OPERATIONS ARE APPROVED, SUBJECT TO FUTURE SEWER DISCHARGES CONFORMING TO THE LOS ALISOS WATER DISTRICT "RULES AND REGULATIONS FOR SEWER CONSTRUCTION, SEWER USE AND INDUSTRIAL WASTE WATER DISCHARGES AND FUTURE REVISIONS."

18. O.C.E.M.A STANDARDS SHALL TAKE PRECEDENCE IN CASE OF ANY CONFLICTS WITH ROADWAY SUBGRADE, PAVEMENT, OR LOCATION OF PARKWAY OBSTRUCTIONS WITHIN STREET RIGHT-OF-WAY.

19. A SET OF "AS-CONSTRUCTED" RECORD DRAWINGS SHALL BE FURNISHED TO THE DISTRICT PRIOR TO RELEASE OF BONDS

WATER NOTES

1. THE WATER SYSTEM SHALL CONFORM TO THE LOS ALISOS WATER DISTRICT'S "STANDARD SPECIFICATIONS FOR DOMESTIC WATER SYSTEM" AS LAST REVISED.

2. THE DISTRICT ENGINEER SHALL BE FURNISHED WITH FOUR COPIES OF APPROVED CONSTRUCTION PLANS PRIOR TO STARTING CONSTRUCTION.

3. THE DISTRICT INSPECTOR SHALL BE NOTIFIED AT LEAST TWO WORKING DAYS PRIOR TO BEGINNING CONSTRUCTION OR ANY INSPECTION. CALL 714-830-0580.

4. WATER MAINS SHALL BE INSTALLED 6-FEET OFF THE CURB FACE, UNLESS OTHERWISE INDICATED, AND PRIOR TO PAVING OF THE STREETS.

5. FIRE HYDRANTS AND BLOWOFFS SHALL BE INSTALLED IN ACCORDANCE WITH THE APPROPRIATE DETAILS HEREIN AND INSTALLED BEHIND CURBS AND SIDEWALKS WHERE THE SIDEWALKS ARE ADJACENT TO CURBS.

6. METER SERVICES SHALL BE SIZED BY THE LOS ALISOS WATER DISTRICT.

7. THE DEVELOPER SHALL FURNISH THE LOS ALISOS WATER DISTRICT WITH EASEMENTS FOR ALL PORTIONS OF THE SYSTEM OUTSIDE OF THE PUBLIC RIGHT-OF-WAY. THESE EASEMENTS SHALL BE RECORDED PRIOR TO FINAL ACCEPTANCE.

8. ALL FLANGED CONNECTIONS SHALL BE COATED WITH TWO COATS OF 10 MILS EACH OF E C 244 MANUFACTURED BY MINNESOTA MINING AND MANUFACTURING AFTER INSTALLATION INCLUDING NUTS, BOLTS AND FLANGES, AND WRAPPED WITH POLYETHYLENE PER AWWA C105.

9. NO FACILITY TO BE BACKFILLED UNTIL INSPECTED BY THE LOS ALISOS WATER DISTRICT

10. SHUTDOWN OF EXISTING WATER LINES TO FACILITATE CONNECTION TO EXISTING FACILITIES SHALL BE COORDINATED WITH THE LOS ALISOS WATER DISTRICT.

11. ALL HOUSE SERVICES BELOW THE FOLLOWING WATER ZONE ELEVATIONS SHALL BE FURNISHED WITH A PRESSURE REDUCING VALVE SET AT A MAXIMUM PRESSURE OF 80 PSI

DISTRICT WATER ZONE	PRV REQUIRED BELOW ELEVATION
I	435
II	680
III	365

12. ALL WATER HOUSE LATERALS ARE TO BE LOCATED WITH A LETTER "W" CHISELED IN CURB FACE PER LOS ALISOS WATER DISTRICT SPECIFICATIONS.

13. WATER METERS LOCATED IN DRIVEWAY AREAS WILL NOT BE ACCEPTED. THE DEVELOPER SHALL RELOCATE SUCH METERS TO A LOCATION ACCEPTABLE TO THE DISTRICT INSPECTOR.

14. O.C.E.M.A STANDARDS SHALL TAKE PRECEDENCE IN CASE OF ANY CONFLICTS WITH ROADWAY SUBGRADE, PAVEMENT, OR LOCATION OF PARKWAY OBSTRUCTIONS WITHIN STREET RIGHT-OF-WAY

15. A SET OF "AS CONSTRUCTED" RECORD DRAWINGS SHALL BE FURNISHED TO THE DISTRICT PRIOR TO RELEASE OF BONDS

RECLAIMED WATER NOTES

1. THE RECLAIMED WATER SYSTEM SHALL CONFORM TO ALL THE LOS ALISOS WATER DISTRICT STANDARD SPECIFICATIONS FOR RECLAIMED WATER SYSTEM AS LAST REVISED.

2. THE DISTRICT ENGINEER SHALL BE FURNISHED WITH FOUR COPIES OF APPROVED CONSTRUCTION PLANS PRIOR TO STARTING CONSTRUCTION.

3. THE DISTRICT INSPECTOR SHALL BE NOTIFIED AT LEAST TWO WORKING DAYS PRIOR TO BEGINNING CONSTRUCTION OR ANY INSPECTION. CALL (714) 830-0580

4. THE DEVELOPER SHALL FURNISH THE LOS ALISOS WATER DISTRICT WITH EASEMENTS FOR ALL PORTIONS OF THE SYSTEM TO BE ACCEPTED BY THE DISTRICT OUTSIDE OF THE PUBLIC RIGHT-OF-WAY. THESE EASEMENTS SHALL BE RECORDED PRIOR TO FINAL ACCEPTANCE.

5. ALL FLANGED CONNECTIONS SHALL BE COATED WITH TWO COATS OF 10 MILS EACH OF E C 244 MANUFACTURED BY MINNESOTA MINING AND MANUFACTURING AFTER INSTALLATION INCLUDING NUTS, BOLTS AND FLANGES, AND WRAPPED WITH POLYETHYLENE PER AWWA C105

6. NO FACILITY TO BE BACKFILLED UNTIL INSPECTED BY THE LOS ALISOS WATER DISTRICT

7. SHUTDOWN OF EXISTING WATER LINES TO FACILITATE CONNECTION TO EXISTING FACILITIES SHALL BE COORDINATED WITH THE LOS ALISOS WATER DISTRICT

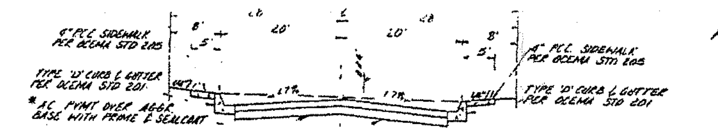
8. A SET OF MYLAR "AS CONSTRUCTED" RECORD DRAWINGS SHALL BE FURNISHED TO THE DISTRICT PRIOR TO RELEASE OF BONDS.

ESTIMATE OF QUANTITIES

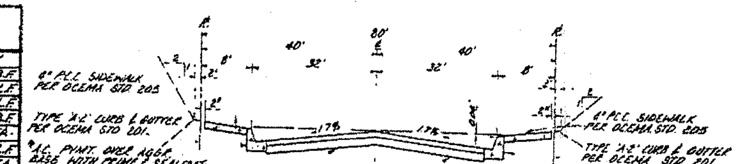
No.	STREET CONSTRUCTION	QUANTITY	
1	CONST. A.C. W/SEALCOAT OVER A.B. W/ PRIME COAT	204,326	S.F.
2	CONST. 6" CONC. CURB & GUTTER TYPE 'D' PER OCEMA STD. PLAN 201.	4,947	L.F.
3	CONST. 8" CONC. CURB & GUTTER TYPE 'A2' PER OCEMA STD. PLAN 201.	2,814	L.F.
4	CONST. 4" THICK CONC. SIDEWALK PER OCEMA STD. PLAN 205.	47,034	S.F.
5	CONST. STREET LIGHT (16,000 LUMEN - 7 EA.; 5800 LUMEN - 17 EA.)	24	EA.
6	REMOVE EXISTING TIMBER BARRICADE	134	L.F.
7	CONST. SIDEWALK RETURN & ACCESS RAMP PER OCEMA STD. 111	14	EA.
8	CONST. LOCAL DEPRESSION PER OCEMA STD. 308	7	EA.
9	INSTALL STREET NAME SIGN	4	EA.
10	CONST. CONC. CROSS GUTTER PER OCEMA STD. PLAN 208.	4,934	S.F.
11	REINSTALL TIMBER BARRICADE-TYPE III, PER OCEMA STD. 404.	89	L.F.
12	INSTALL STOP SIGN	3	EA.
13	INSTALL W-53 (NOT A THROUGH STREET) SIGN	1	EA.
14	6" TO 8" C.F. CURB TRANSITION	218	L.F.
15	OTHER SIGNING & STRIPING	1	L.S.
16	CONST. 6" A.C. DIKE PER O.C.E.M.A. STD. 201	—	L.F.
17	CONST. CONC. CROSS GUTTER PER OCEMA STD. PLAN 207	3,620	SF
18	CONST. PARKWAY CULVERT PER O.C.E.M.A. STD. 309	1	EA.
19	CONST OUTLET PIPE PER DETAIL SHT. 4	1	EA.
20	6" CONC. CURB	342	LF
	STRIPING		
	STRIPE 4" DOUBLE YELLOW LINE	1088	LF
	STRIPE 4" DASH LINE (7' STRIPE - 17' GAP) - WHITE	2655	LF
	12" SOLID WHITE LIMIT LINE & STOP LEGEND	2	EA
	STRIPE 8" SOLID WHITE LINE	270	LF
	STENCIL PAVEMENT ARROW	4	EA
21	4' WIDE ALLEY GUTTER	152	LF
22	CONST 7" STAMPED CONC. OR BRICK PAVERS	375	SF
	SEWER CONSTRUCTION		
30	CONST. STD. MANHOLE 48" I.D. PER L.A.W.D. STD. PLAN S-1	15	EA.
31	CONST. 8" V.C.P. SEWER PER L.A.W.D. STD. PLANS & SPECS.	4,341	L.F.
32	REMOVE EXISTING V.C.P. STOPPER & JOIN	3	EA.
33	INSTALL 8" V.C.P. STOPPER	9	EA.
34	CONST. CONC. ENCASEMENT PER L.A.W.D. STD. PLANS & SPECS.	10	L.F.
35	CONST. STD. MANHOLE 60" I.D. PER L.A.W.D. STD. PLAN S-1	2	EA.
36	CONST. 4" VCP LATERAL PER L.A.W.D. STDS.		LF
	WATER CONSTRUCTION		
40	INSTALL 16" A.C.P. WATERMAIN (CL 150) PER L.A.W.D. STD. PLANS & SPECS.	1942	L.F.
41	INSTALL 10" A.C.P. WATERMAIN (CL 200) PER L.A.W.D. STD. PLANS & SPECS.	2080	L.F.
42	INSTALL 16" BUTTERFLY VALVE PER L.A.W.D. STD. W-6	8	EA.
43	INSTALL 10" BUTTERFLY VALVE PER L.A.W.D. STD. W-6	8	EA.
44	INSTALL 8" A.C.P. WATERMAIN (CL 150) PER L.A.W.D. STD. PLANS & SPECS.	200	L.F.
45	INSTALL 8" BUTTERFLY VALVE PER L.A.W.D. STD. W-6	14	EA.
46	INSTALL TEMP BLOWOFF PER L.A.W.D. STD. W-7B	1	EA.
47	INSTALL PLUG PER L.A.W.D. STD. PLANS & SPECS.	26	EA.
48	REMOVE PLUG & JOIN EXIST. A.C.P. MAIN	2	EA.
49	INSTALL 3/4" WATER SERVICE PER L.A.W.D. STD. W-1 & W-5	1	EA
50	INSTALL BLOWOFF ASSEMBLY PER L.A.W.D. STD. W-7B	1	EA.
51	INSTALL 8" A.C.P. WATERMAIN (CL 200) PER L.A.W.D. STD. PLANS & SPECS.	616	L.F.
52	INSTALL FIRE HYDRANT ASSEMBLY PER L.A.W.D. STD. W-5	10	EA.
53	INSTALL 4" AWWA C900 PVC CL150 PER L.A.W.D. STD. PLANS & SPECS	3056	L.F.
54	INSTALL 4" BUTTERFLY VALVE PER L.A.W.D. STDS. W-6, R-2	12	EA.
55	INSTALL 2" IRRIGATION METER	1	EA
56	INSTALL 6" AWWA C900 PVC. CL.150 PER L.A.W.D. STD. PLANS & SPECS.	940	LF.

QUANTITIES CONT.

No.	STORM DRAIN CONSTRUCTION	QUANTITY	
60	REMOVE EXISTING RISER	1	EA.
61	CONST. INLET TYPE II PER OCEMA STD. 302.	3	EA.
62	CONST. J.S. TYPE I-MANHOLE PER OCEMA STD. 310.	2	EA.
63	CONST. J.S. TYPE I- NO MANHOLE PER OCEMA STD. 310.	1	EA.
64	CONST. J.S. TYPE III PER OCEMA STD. 312.		
65	CONST. REINFORCED CONCRETE COLLAR PER STD. 317.	2	EA.
66	INSTALL 33" R.C.P. - 1750 D	344	L.F.
67	INSTALL 30" R.C.P. - 1750 D	128	L.F.
	INSTALL 30" R.C.P. - 2000 D	311	L.F.
68	INSTALL 18" R.C.P. - 1750 D	68	L.F.
	INSTALL 18" R.C.P. - 2000 D	412	L.F.
69	CONST. TEMPORARY INLET PER DETAILS SHT. 8	1	EA.
70	CONST. REINFORCED CONCRETE INLET PER. SHT. 7	1	EA.

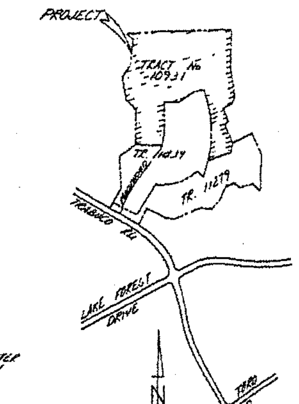


PALMWOOD
TAMARISK

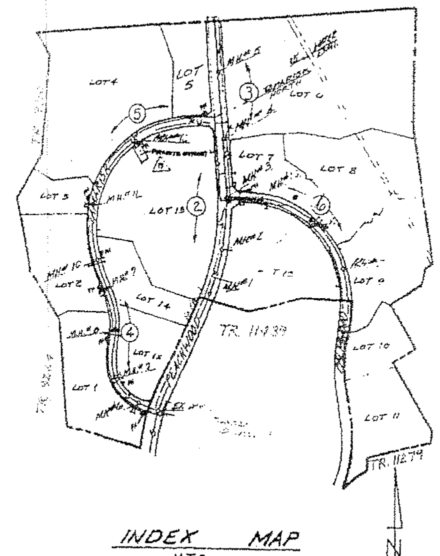


PEACHWOOD

STREET	LIMITS STATION TO STATION		* STRUCTURAL SECTION
PEACHWOOD			
PALMWOOD			
TAMARISK			



LOCATION MAP
N.T.S.



INDEX MAP
N.T.S.

CONTRACTOR AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY. THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS: AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD THE OWNER, THE ENGINEER, AND THE COUNTY OF ORANGE HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING FOR LIABILITY ARISING FROM SOLE NEGLIGENCE OF OWNER, ENGINEER OR COUNTY OF ORANGE.

REVISION (CONT.)

No.	REVISION	SHT	APPROVED	DATE
	ADDED FUTURE INTERSECTION TAMARISK & PALMWOOD	4&6	D.M. [signature]	3/11/86
	ADDED PRIVATE STREET IMPROVEMENTS	5	D.M. [signature]	8/21/85
	STA. 10+79.68 ADDED CURB RETURNS STA. 10+10.71	4	D.M. [signature]	8/21/85

UTILITY APPROVAL AND REVISIONS

FOR RECLAIMED WATER IMPROVEMENTS: LOS ALISOS WATER DISTRICT — Phillip M. Miller [signature], R.C.E., DATE 2-23-83

FOR RECLAIMED WATER OPERATIONS: LOS ALISOS WATER DISTRICT — E.T. McFadden [signature], GENERAL MANAGER, DATE 2-23-83

FOR SEWER IMPROVEMENTS: LOS ALISOS WATER DISTRICT — Phillip M. Miller [signature], R.C.E., DATE 2-23-83

FOR SEWER SYSTEM OPERATION: LOS ALISOS WATER DISTRICT — E.T. McFadden [signature], GENERAL MANAGER, DATE 2-23-83

FOR WATER IMPROVEMENTS: LOS ALISOS WATER DISTRICT — Phillip M. Miller [signature], R.C.E., DATE 2-23-83

FOR WATER SYSTEM OPERATION: LOS ALISOS WATER DISTRICT — GENERAL MANAGER, DATE

REVISION	DATE	APP'D
ADDITIONAL RECLAIMED WATER ADDED, LINE SIZE REVISED, AND ITEMS 56, DELETE 44, 55, QUANTITIES REVISED, SHT 2-4	9/28/84	[initials]
ADDED SEWER & ...	4/6/85	[initials]
ADDED WATER TAMARISK & LOT 15	10-18-85	[initials]
LOWERED M.H.S ...	1-23-85	[initials]
...	9-28-84	[initials]
MOVED M.H. NO 2 ...	12-4-84	[initials]
REV. VERT. ALIGN & V.C.P. ... SHT 4	12-4-84	[initials]
LOWERED ...	12-4-84	[initials]
ADD M.H. PEACHWOOD ... SEWER	12-4-84	[initials]

REVISION	DATE	APP'D
RELOCATE LATERAL TO ...	4-18-84	[initials]
MOVED T.R. LATERAL AT M.H. #3 10' S. SHT 4	5-4-84	[initials]
RELOCATE R.C.P. STUBS ... SHT 4 & 5	12-4-84	[initials]
LOWERED V.C.R. STA. 4+41 ...	5-11-84	[initials]
MOVED WATER LINE TO EAST SIDE OF M.H. 4/6 SHT. 6	3-4-85	[initials]

DESIGN BY: DPH · 10/15/82
DRAWN BY: DPH · 10/13-82
CHECKED BY: DLS · 12/6/82

DEVELOPER:

WARMINGTON DEVELOPMENT CORP
1641 LANGLEY AVE.
IRVINE, CA 92714
(714) 557-5511

SHOWCASE HOMES
14482 BEACH BLVD. STE W
WESTMINSTER, CA
(714) 534-9620

FIRE PROTECTION APPROVAL:

[signature] — 1-13-83 DATE
ORANGE COUNTY FIRE DEPARTMENT

COUNTY OF ORANGE
E.M.A. REGULATION DIVISION

APPROVED BY: Floyd H. McLellan Jr. [signature] R.C.E. CE 9809 — 3/7/83 DATE

THIS PLAN IS SIGNED BY E.M.A./REGULATION FOR CONCEPT AND ADHERENCE TO COUNTY STANDARDS AND REQUIREMENTS ONLY. E.M.A./REGULATION IS NOT RESPONSIBLE FOR DESIGN, ASSUMPTIONS OR ACCURACY.

LEGEND

SYMBOL	LEGEND
	V.C.P. SEWER MAIN & MANHOLE
	STREET LIGHT (5800 LUMENS)
	STREET NAME SIGN
	FIRE HYDRANT
	A.C.P. WATER LINE
	BUTTERFLY VALVE
	BLOW OFF
	R.C.P. STORM DRAIN
	STREET LIGHT (16,000 LUMENS)
	DOUBLE STREET LIGHT (16,000 LUMENS)
	STREET LIGHT (22,000 LUMENS)

STREET NAME SIGNS

LOCATION	NAME	NAME
SE	PEACHWOOD	[illegible]
NW	PEACHWOOD	[illegible]

REVISIONS

No.	DESCRIPTION	SHT.	APPROVED	DATE
	ADDED CURB RETURNS PER TR. 10931, LOT 15 RECONST. S.D. LATERAL AND INLET & STA. 6+25, AND DETAIL SHT. 8	4,8	[signature]	12-12-84
	ADDED NOTE No. 16 - A.C. DIKE STA. 8+19 TO 8+71, REMOVED C.G. & SDWK.	4	[signature]	"
	ADDED CURB RETURNS PER TR. 11441 (LOT 12)	6	[signature]	"
	ADDED CURB RETURNS TR. 10931 (LOT 2) STA. 8+10 TO 8+79, PKWY CULVERT & STA. 7+80 OUTLET PIPE & STA. 7+06.83 DETAIL	4	[signature]	2-25-85
	ADDED PARKWAY CULVERTS ..., REMOVED TEMP ...	4,5	[signature]	3-15-85

BASIS OF BEARINGS

THE BEARINGS SHOWN HEREON ARE BASED ON THE EASTERLY LINE OF TRACT No 9110 BEING N11°05'40"W AS SHOWN ON A MAP FILED IN BOOK 391, PAGES 45, 46, 47 & 48, OF MISCELLANEOUS MAPS, RECORDS OF ORANGE COUNTY, CALIFORNIA, SAID BEARING BEING ROTATED COUNTERCLOCKWISE 0°00'21" FOR THE PURPOSE OF THIS PLAN.

BENCH MARK 3E-61-71

ALUMINUM CAP STAMPED 3E-61-71 ABOUT 1 MI. N.W. ALONG TRABUCO RD. FROM INT. OF EL TORO RD. & ABOUT 0.2 MI. N.W. ALONG TRABUCO RD. FROM INT. OF CANADA RD. TO CONCRETE BRIDGE OVERCROSSING OF SERRANO CREEK; N. N.E. OF C OF TRABUCO, SET IN TOP OF N.E. END OF CONC. RTG. WALL OF BRIDGE, LEVEL WITH ROAD.

ELEV. 444.561 · 1970 ADJ.

Hunsaker & Associates Inc.

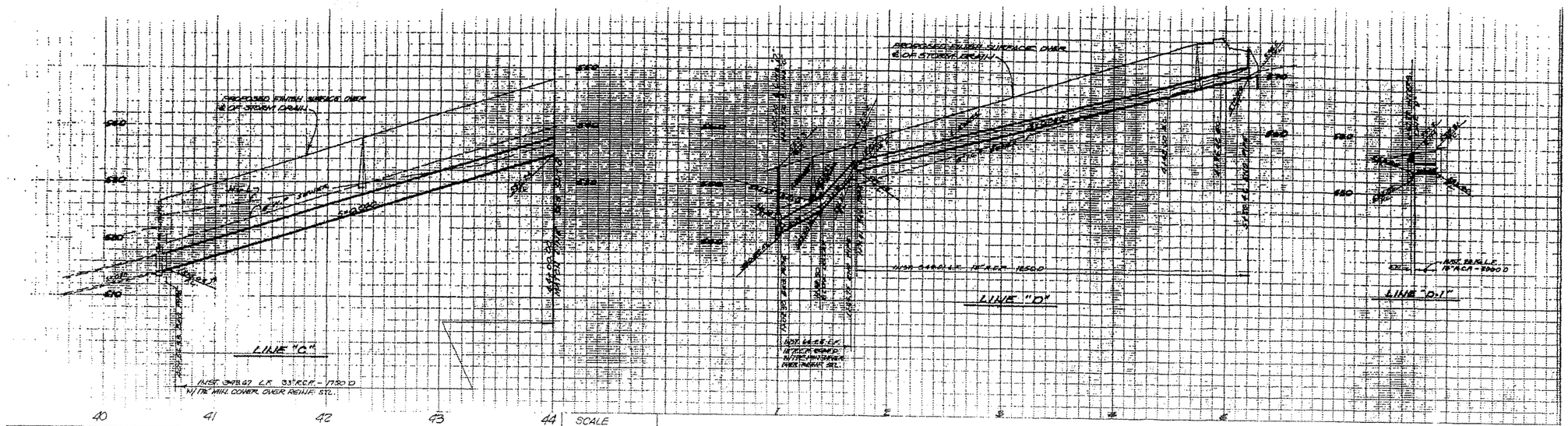
Tom R. McHannon [signature] — 10-13-82
R.C.E. 23556 — DATE

IMPROVEMENT PLANS

A PORTION OF TENTATIVE TRACT No. 10931
SERRANO HIGHLANDS
TRACT No. 10931 & 12304
TITLE SHEET

SHEET 1 OF 3 SHEETS

TR. TMF # 10931

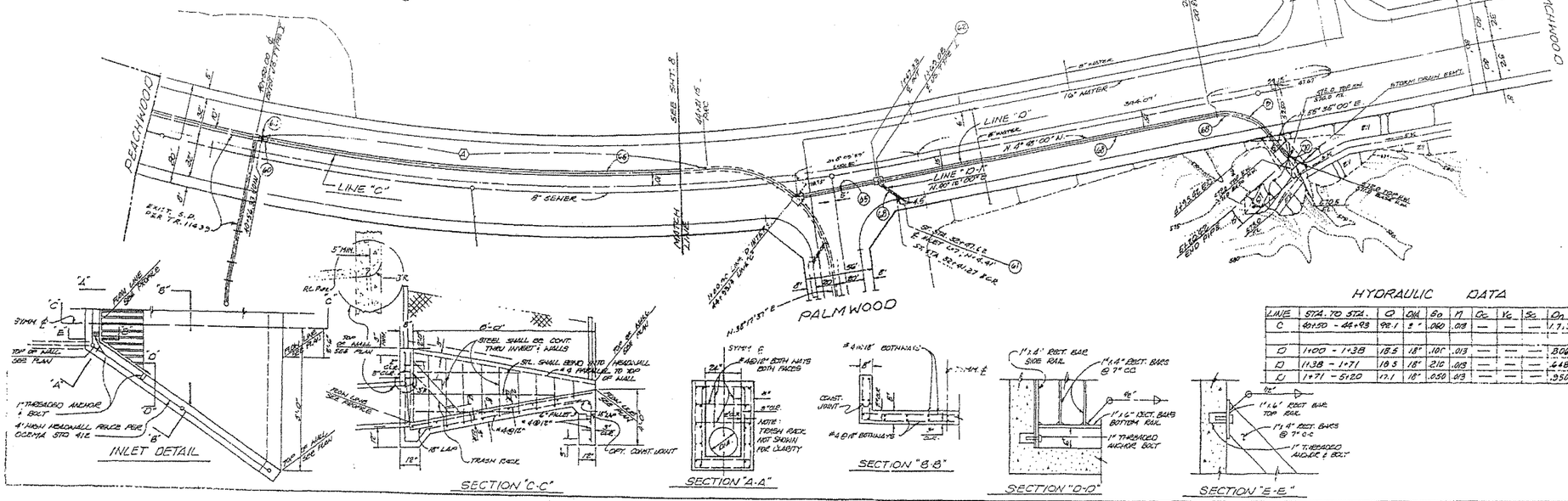


CURVE DATA				
	Δ	R	L	T
(A)	15°17'56"	1390'	371.15	186.69
(B)	4°-35'-00"	45'	97.02'	25.18'

SCALE
PLAN: 1"=40'
PROFILE-HORIZ: 1"=40'
VERT: 1"=8'

CONSTRUCTION NOTES

(42) CONST. VS TYPE I PER O.C.E.M.A. STD. 312
(43) CONST CONC. COLLAR PER O.C.E.M.A. STD. 317
(44) CONST. VS. TYPE III PER OCEMA STD 312
(45) INST. 33" RCP (SEE PROFILE FOR D-LOAD)
(46) INST. 18" RCP (SEE PROFILE FOR D-LOAD)
(70) CONST. REINFORCED CONCRETE INLET PER DETAILS HEREON
(61) CONST. INLET TYPE II PER OCEMA STD 302
(43) JOIN EXIST. 33" R.C.P.
(60) REMOVE EXIST. RISER

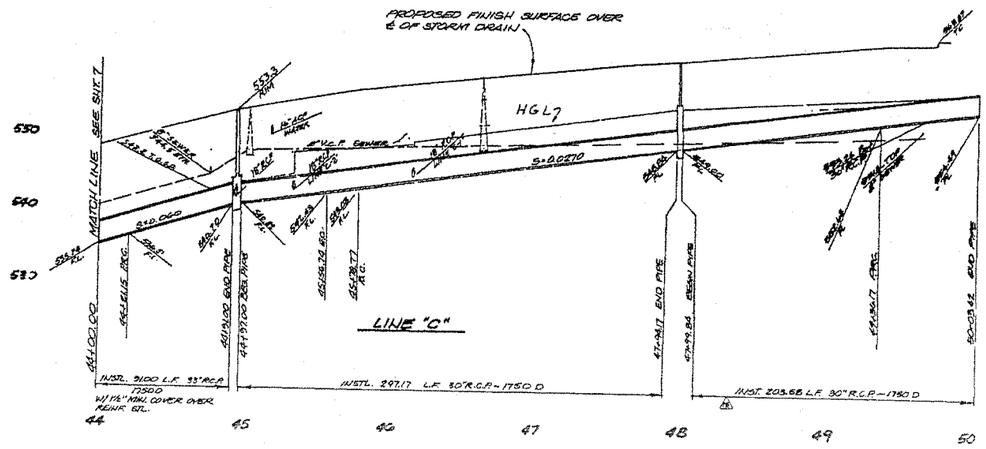


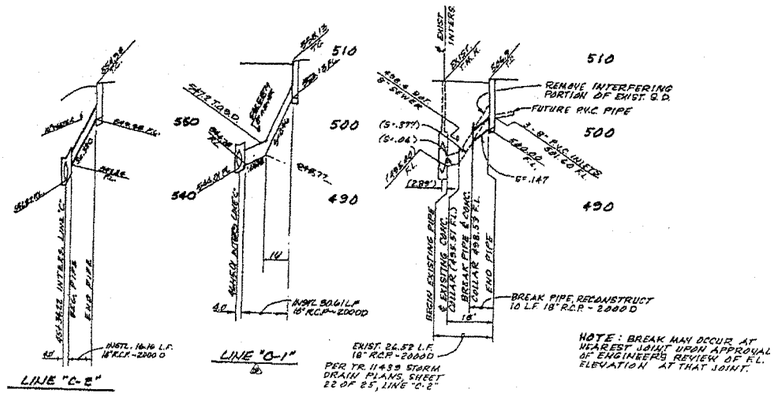
HYDRAULIC DATA

LINE	STA. TO STA.	Q	Qw	So	n	Cc	Vc	Sc	Qn	Vn	Yf	Sf
C	40+50 - 44+93	98.1	8"	.060	.013	—	—	—	17.3	23.67	[illegible]	[illegible]
D	1+00 - 1+38	18.5	18"	.101	.013	—	—	—	306	13.12	10.47	0310
D	1+38 - 1+71	18.5	18"	.210	.013	—	—	—	.648	25.29	10.47	[illegible]
D	1+71 - 5+20	17.1	18"	.050	.013	—	—	—	.950	16.49	9.68	0265

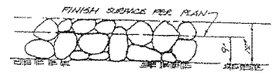
SHEET 7 OF SHEETS 9
TRAC 10931

TR. IMP. # 10931



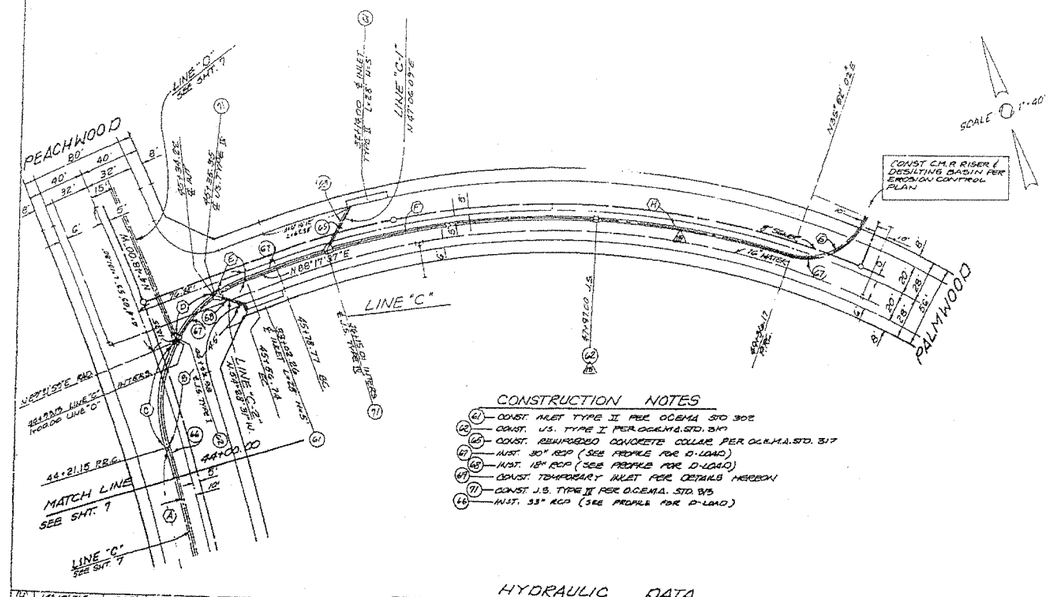


LATERAL RECONSTRUCTION DETAIL
IN TAMARISK - STA. 5+00.00 ℄ INLET - SHEET 4



GROUTED RIP-RAP
TYPICAL SECTION
NO SCALE

1. ROCK FOR GROUTED RIP-RAP SHALL BE GOOD QUALITY BROKEN CONCRETE AND/OR FIRM RIP ROCK. THE SMALLEST DIMENSION SHALL EXCEED 3 INCHES AND THE LARGEST DIMENSION SHALL NOT EXCEED 18 INCHES. THE LARGEST DIMENSION SHALL NOT EXCEED 4 TIMES THE SMALLEST DIMENSION.
2. THERE SHALL BE A GROUT BED OF AT LEAST 2 INCHES BENEATH THE FIRST LAYER OF ROCK. ALL THE VOIDS BETWEEN THE ROCKS SHALL BE FILLED WITH GROUT. MAXIMUM SPACING BETWEEN THE ROCKS SHALL BE 2 INCHES. SURFACE ROCKS SHALL BE EMBEDDED FROM 1/2 TO 2/3 THEIR VERTICAL DIMENSION.



CONSTRUCTION NOTES

(47) — CONST. INLET TYPE II PER O.C.E.M.A. STD. 302
(52) — CONST. V.S. TYPE I PER O.C.E.M.A. STD. 310
(56) — CONST. REINFORCED CONCRETE COLLAR PER O.C.E.M.A. STD. 317
(57) — INST. 30" RCP (SEE PROFILE FOR D-LOAD)
(58) — INST. 18" RCP (SEE PROFILE FOR D-LOAD)
(61) — CONST. TEMPORARY INLET PER DETAILS HEREON
(71) — CONST. J.B. TYPE II PER O.C.E.M.A. STD. 815
(44) — INST. 33" RCP (SEE PROFILE FOR D-LOAD)

HYDRAULIC DATA

LINE	STA TO STA	Q	DIA	S_o	n	Q_c	Y_c	S_c	On	V_n	V_f	Sf
C	44+91 - 45+35	76.5	30"	.023	.013	FULL	—	—	FULL	—	15.65	.03506
C	45+35 - 46+15	60.1	30"	.023	.013	FULL	—	—	1.97	14.49	12.24	.02147
C	46+15 - 50+03	43.3	30"	.0270	.013	2.20	3.48	.001	1.46	14.68	8.82	.01116

(B)	14°19'25"	848'	134.93	68.01'
(E)	18°20'12"	90'	28.58'	7.52'
(D)	26°09'31"	90'	41.09'	20.91'
(C)	85°08'28"	90'	71.38'	38.06'
(B)	66°19'11"	90'	135.59	84.60'
(A)	13°17'36"	1560'	361.15'	182.09'
(G)	26°37'35"	45	41.25'	21.09'
(D)	21°18'29"	845'	157.17	79.52'
	Δ	R	L	T

HORIZONTAL CURVE DATA

SHEET 8 OF SHEETS 9

WO. 45-0931

TR. IMP. 5/0931

B. TRACT 12603 STORM DRAIN IMPROVEMENT PLANS

IMPROVEMENT PLANS FOR
TRACT 12603
PORTION OF TRACT 10931
LOTS 7, 8 & 9

BLOCK 54S6
MODULE 53&54

112 UNITS

GENERAL NOTES

1. THIS NOTE HEREIN INCORPORATES BY REFERENCE. THOSE GENERAL NOTES NUMBERED 1 THROUGH 17 INCLUSIVE. OF OCEMA STANDARD PLAN 801. 1983 EDITION AND MARCH 1985 SUPPLEMENT.
2. THE DEVELOPER / CONTRACTOR SHALL HAVE A COPY OF THE CURRENT OCEMA STANDARD PLANS ON THE CONSTRUCTION SITE AT ALL TIMES.
3. THE DEVELOPER SHALL TELEPHONE EMA / PUBLIC WORKS / CONSTRUCTION AT LEAST 24 HOURS PRIOR TO STARTING CONSTRUCTION WORK SUBJECT TO EMA / PUBLIC WORKS' INSPECTION.
4. ALL HIGHWAY SIGNS AND STREET NAME SIGNS SHOWN ON THE PLAN MUST BE SUPPLIED AND INSTALLED BY THE DEVELOPER PER OCEMA STANDARD PLAN NOS. 407, 408, 409 AND 417.
5. ALL CONCRETE CURB AND GUTTER FLOWLINES WITH LESS THAN 1% GRADE SHALL BE WATER TESTED PRIOR TO FINAL FINISHING TO INSURE PROPER DRAINAGE WITHOUT UNACCEPTABLE HIGH OR LOW SPOTS.
6. ALL UTILITY TRENCH BACKFILL AND COMPACTION INSPECTION OUTSIDE THE LIMITS OF DEDICATED STREET RIGHT-OF-WAY SHALL BE PERFORMED BY OCEMA REGULATION.
7. ALL DAMAGED CONCRETE SIDEWALKS OR CURBS SHALL BE SAWCUT TO THE NEAREST TRANSVERSE SCORE MARK OR ADJUSTABLE CONTROL JOINT OR WEAKENED PLANE JOINT AND REPLACED IN CONFORMANCE WITH THE APPLICABLE PROVISIONS OF OCEMA STANDARD PLANS.
8. DEVELOPER SHALL MAINTAIN ADJACENT STREETS IN A NEAT, CLEAN, DUST FREE AND SANITARY CONDITION AT ALL TIMES AND TO THE SATISFACTION OF COUNTY'S INSPECTOR. THE ADJACENT STREETS SHALL BE KEPT CLEAN OF DEBRIS, WITH DUST AND OTHER NUISANCE BEING CONTROLLED AT ALL TIMES. DEVELOPER SHALL BE RESPONSIBLE FOR ANY CLEAN UP ON ADJACENT STREETS AFFECTED BY HIS CONSTRUCTION. METHOD OF STREET CLEANING SHALL BE BY DRY SWEEPING OF ALL PAVED AREAS. NO STOCKPILING OF BUILDING MATERIALS WITHIN THE COUNTY RIGHT-OF-WAY WITHOUT THE PERMISSION OF COUNTY'S INSPECTOR.
9. PRIOR TO FINAL ACCEPTANCE OF STREET IMPROVEMENTS, ALL STREET PAVEMENT, STRIPING AND STENCILING WITHIN THE PERIMETER OF THE CONSTRUCTION PROJECT WILL BE RESTORED TO A "LIKE NEW" CONDITION, IN A MANNER MEETING THE APPROVAL OF THE DIRECTOR OF PUBLIC WORKS. ALL STRIPING AND STENCILING SHALL BE ACCORDING TO STANDARD PLAN NO.801, NOTE 17.
10. TRAFFIC SHALL BE MAINTAINED AT ALL TIMES AND SHALL BE PROTECTED WITH ADEQUATE BARRICADES, LIGHTS, SIGNS AND WARNING DEVICES AS PER THE CURRENT STATE OF CALIFORNIA, DEPARTMENT OF TRANSPORTATION, MANUAL OF TRAFFIC CONTROLS AND TO THE DIRECTIONS OF THE COUNTY'S INSPECTOR.
11. OCEMA STANDARD PLANS SHALL TAKE PRECEDENCE OVER ANY CONFLICTS EXCEPT FOR STANDARD PLANS AFFECTING UTILITY COMPANIES, IF THEIR STANDARDS ARE MORE STRINGENT.
12. ANY UTILITIES UNDER PAVED AREAS OF PRIVATE STREETS SHALL HAVE A MINIMUM OF 30" COVER AND DEVELOPER SHALL PROVIDE PRIVATE LABORATORY COMPACTION CERTIFICATION FOR ALL UNDERGROUND UTILITIES PRIOR TO ANY PAVING. DEVELOPER SHALL SET UP A MEETING WITH THE INSPECTOR AND THE PRIVATE LABORATORY PRIOR TO ANY TESTING.
13. A.C. PAVEMENT PLACED UNDER CARPORTS / ROOFS SHALL BE SLURRY SEALED BEFORE FINAL ACCEPTANCE.
14. NO CONCENTRATED FLOW ALLOWED ACROSS ASPHALT PAVEMENT
15. ALL ON SITE STREET LIGHTS ARE TO BE CONSTRUCTED AND MAINTAINED AS A PRIVATE SYSTEM.
16. PARKING LOT SIGNING AND STRIPING SHALL CONFORM TO O.C.E.M.A. STANDARD 681

WATER NOTES

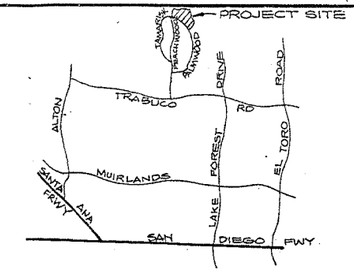
1. THE WATER SYSTEM SHALL CONFORM TO THE LOS ALISOS WATER DISTRICT'S "STANDARD SPECIFICATIONS FOR DOMESTIC WATER SYSTEM" AS LAST REVISED.
2. THE DISTRICT ENGINEER SHALL BE FURNISHED WITH FOUR COPIES OF APPROVED CONSTRUCTION PLANS PRIOR TO STARTING CONSTRUCTION.
3. THE DISTRICT INSPECTOR SHALL BE NOTIFIED AT LEAST TWO WORKING-DAYS PRIOR TO BEGINNING CONSTRUCTION OR ANY INSPECTION. CALL 714-830-0580.
4. WATER MAINS SHALL BE INSTALLED 6-FEET OFF THE CURB FACE, UNLESS OTHERWISE INDICATED, AND PRIOR TO PAVING OF THE STREETS.
5. FIRE HYDRANTS AND BLOWOFFS SHALL BE INSTALLED IN ACCORDANCE WITH THE APPROPRIATE DETAILS HEREIN AND INSTALLED BEHIND CURBS AND SIDEWALKS WHERE THE SIDEWALKS ARE ADJACENT TO CURBS.
6. METER SERVICES SHALL BE SIZED BY THE LOS ALISOS WATER DISTRICT.
7. THE DEVELOPER SHALL FURNISH THE LOS ALISOS WATER DISTRICT WITH EASEMENTS FOR ALL PORTIONS OF THE SYSTEM OUTSIDE OF THE PUBLIC RIGHT-OF-WAY. THESE EASEMENTS SHALL BE RECORDED PRIOR TO FINAL ACCEPTANCE.
8. ALL FLANGED CONNECTIONS SHALL BE COATED WITH TWO COATS OF 10 MILS EACH OF E C 204 MANUFACTURED BY MINNESOTA MINING AND MANUFACTURING AFTER INSTALLATION INCLUDING NUTS, BOLTS AND FLANGES, AND WRAPPED WITH POLYETHYLENE PER AWWA C105.
9. NO FACILITY TO BE BACKFILLED UNTIL INSPECTED BY THE LOS ALISOS WATER DISTRICT.
10. SHUTDOWN OF EXISTING WATER LINES TO FACILITATE CONNECTION TO EXISTING FACILITIES SHALL BE COORDINATED WITH THE LOS ALISOS WATER DISTRICT.
11. ALL HOUSE SERVICES BELOW THE FOLLOWING WATER ZONE ELEVATIONS SHALL BE FURNISHED WITH A PRESSURE REDUCING VALVE SET AT A MAXIMUM PRESSURE OF 80 PSI.

DISTRICT WATER ZONE	PRV REQUIRED BELOW ELEVATION
I	435
II	680
III	865

12. ALL WATER HOUSE LATERALS ARE TO BE LOCATED WITH A LETTER "W" CHISELED IN CURB FACE PER LOS ALISOS WATER DISTRICT SPECIFICATIONS.
13. WATER METERS LOCATED IN DRIVEWAY AREAS WILL NOT BE ACCEPTED. THE DEVELOPER SHALL RELOCATE SUCH METERS TO A LOCATION ACCEPTABLE TO THE DISTRICT INSPECTOR.
14. O.C.E.M.A. STANDARDS SHALL TAKE PRECEDENCE IN CASE OF ANY CONFLICTS WITH ROADWAY SUBGRADE, PAVEMENT, OR LOCATION OF PARKWAY OBSTRUCTIONS WITHIN STREET RIGHT-OF-WAY.
15. A SET OF "AS CONSTRUCTED" RECORD DRAWINGS SHALL BE FURNISHED TO THE DISTRICT PRIOR TO RELEASE OF BONDS.

SEWER NOTES

1. ALL SANITARY SEWER WORK SHALL CONFORM TO THE "STANDARD SPECIFICATIONS FOR THE CONSTRUCTION OF SEWERS" OF THE LOS ALISOS WATER DISTRICT. THE CONTRACTOR SHALL KEEP A COPY OF THE STANDARD SPECIFICATIONS AND DRAWINGS ON THE JOB SITE AT ALL TIMES.
2. FOUR COPIES OF APPROVED CONSTRUCTION PLANS SHALL BE FURNISHED TO THE DISTRICT ENGINEER'S OFFICE PRIOR TO BEGINNING CONSTRUCTION.
3. THE DISTRICT INSPECTOR SHALL BE NOTIFIED AT LEAST TWO WORKING DAYS PRIOR TO ANY INSPECTION. CALL (714) 830-0580.
4. FOUR-INCH, INTERNAL DIAMETER, VCP HOUSE CONNECTIONS ARE TO BE CONSTRUCTED FROM THE SEWER MAIN LINE TO THE PROPERTY LINE FOR EACH LOT OR AS SHOWN ON THE PLANS.
5. ALL SEWER MAINS, HOUSE CONNECTIONS, AND APPURTENANCES SHALL BE CONSTRUCTED PRIOR TO PAVING OF THE STREET.
6. SEWER LENGTHS ARE CALCULATED ON HORIZONTAL DISTANCES.
7. VCP STUBS AND THE FIRST TWO JOINTS OUT OF ALL MANHOLES SHALL BE ONE FOOT MAXIMUM MEASURED FROM THE INSIDE WALL OF THE MANHOLE.
8. THE SURVEYOR SHALL STAKE THE LOCATION OF ALL WYE FITTINGS. ALL HOUSE LATERALS NOT NORMAL TO STREET SEWERS SHALL HAVE END OF LATERAL AT PROPERTY LINE STAKED AND TIED TO A PROPERTY LINE AS SHOWN ON THE PLANS.
9. IT SHALL BE THE RESPONSIBILITY OF THE SEWER CONTRACTOR TO EXPOSE ALL JOINT POINTS TO EXISTING LINES AND TO HAVE THE LOCATION AND ELEVATION VERIFIED BY THE DISTRICT ENGINEER PRIOR TO ANY SEWER STAKES BEING FURNISHED.
10. THE LOS ALISOS WATER DISTRICT WILL INSPECT ALL MAIN LINE SEWERS. THE ORANGE COUNTY BUILDING AND SAFETY DEPARTMENT WILL INSPECT AND CERTIFY ALL HOUSE LATERALS. A MINIMUM OF 10 FEET 4 INCHES OF HOUSE LATERAL SHALL BE INSTALLED AND INSPECTED BY THE ORANGE COUNTY BUILDING AND SAFETY DEPARTMENT AND TESTED JOINTLY WITH THE MAIN LINE UNDER THE JURISDICTION OF THE LOS ALISOS WATER DISTRICT.
11. IN ORDER TO PREVENT ACCIDENTAL USE OF THE NEW SEWER PRIOR TO COMPLETION AND ACCEPTANCE, THE INLET OF THE DOWNSTREAM EXISTING MANHOLE SHOULD BE PLUGGED WITH BRICK AND MORTAR.
12. NO FACILITY SHALL BE BACKFILLED UNTIL INSPECTED BY THE LOS ALISOS WATER DISTRICT.
13. SEWER MAIN OWNERSHIP - UPON COMPLETION OF ALL TESTS AND DEDICATION BY THE DEVELOPER, OPERATION AND MAINTENANCE SHALL BE THE RESPONSIBILITY OF LOS ALISOS WATER DISTRICT.
14. SEWER LATERAL OWNERSHIP - UPON COMPLETION OF ALL TESTS AND ACCEPTANCE BY THE ORANGE COUNTY BUILDING DEPARTMENT, OPERATION AND MAINTENANCE SHALL NOT BE THE RESPONSIBILITY OF LOS ALISOS WATER DISTRICT.
15. PROVIDE A CLEANOUT STUB OUTSIDE OF THE HOUSE OR GARAGE AND IDENTIFY WITH A LANDMARK TO FACILITATE SEWER HOUSE LATERALS AND MAIN LINE CLEANING.
16. ALL SEWER HOUSE LATERALS ARE TO BE LOCATED WITH A LETTER "S" CHISELED IN CURB FACE PER LOS ALISOS WATER DISTRICT SPECIFICATIONS.
17. THE SEWER IMPROVEMENTS AND SEWER SYSTEM OPERATIONS ARE APPROVED, SUBJECT TO FUTURE SEWER DISCHARGES CONFORMING TO THE LOS ALISOS WATER DISTRICT "RULES AND REGULATIONS FOR SEWER CONSTRUCTION, SEWER USE AND INDUSTRIAL WASTE WATER DISCHARGES AND FUTURE REVISIONS."
18. O.C.E.M.A. STANDARDS SHALL TAKE PRECEDENCE IN CASE OF ANY CONFLICTS WITH ROADWAY SUBGRADE, PAVEMENT, OR LOCATION OF PARKWAY OBSTRUCTIONS WITHIN STREET RIGHT-OF-WAY.
19. A SET OF "AS-CONSTRUCTED" RECORD DRAWINGS SHALL BE FURNISHED TO THE DISTRICT PRIOR TO RELEASE OF BONDS.



VICINITY MAP
NO SCALE

STORM DRAIN GENERAL NOTES:

1. ALL CONCRETE IN REINFORCED CONCRETE STRUCTURES MUST BE 3250 POUNDS PER SQUARE INCH. IN 28 DAYS. TYPE of PORTLAND CEMENT CONCRETE. TO BE DETERMINED BY O.C.E.M.A. MATERIALS LAB.
2. ALL PIPE LENGTHS ARE HORIZONTAL PROJECTIONS, UNLESS OTHERWISE SHOWN.
3. FOR TRENCH EXCAVATIONS IN NATIVE SOIL, SHORING SHALL BE PROVIDED TO SATISFY STATE OF CALIFORNIA REQUIREMENTS.
4. PIPE CONSTRUCTION IN FILL AREA MUST BE COORDINATED WITH THE GRADING TO INSURE THAT WHEN THE FILL OPERATION HAS BEEN COMPLETED AT GRADE A MINIMUM OF TWO FEET OF FILL ABOVE THE TOP OF PIPE
5. LOCAL DEPRESSIONS AND PICKING OF CURB INLETS SHALL NOT BE POURED UNTIL ADJACENT CURB AND GUTTER HAS BEEN POURED
6. ALL WORK MUST BE IN CONFORMANCE WITH THE ORANGE COUNTY E.M.A. STANDARD SPECIFICATIONS WHICH MAY BE PURCHASED FROM THE COUNTY AND MUST BE KEPT ON THE JOB SITE AT ALL TIMES.
7. ALL SURVEYING REQUIRED FOR VERTICAL AND HORIZONTAL ALIGNMENT MUST BE PROVIDED BY THE CONTRACTOR OR DEVELOPER AND SUFFICIENT REFERENCE STAKING MUST BE IN ACCORDANCE WITH THE REQUEST OF THE O.C.E.M.A. INSPECTOR.
8. ALL REINFORCED CONCRETE PIPE MUST BE BEDDED IN ACCORDANCE WITH PIPE BEDDING DETAIL PER O.C.E.M.A. STANDARD 319.
9. PRIOR TO THE PLACEMENT OF STORM DRAIN IMPROVEMENTS, THE DEVELOPERS' SOIL ENGINEER SHALL CERTIFY IN WRITING TO THE E.M.A. INSPECTOR THAT THE STORM DRAINS SUBGRADE IS OF ADEQUATE STRENGTH TO SUPPORT THE STRUCTURES AND ANY ANTICIPATED LOADS.
10. ALL MATERIALS TESTING FOR THE DRAINAGE FACILITIES SHALL BE PROVIDED BY THE O.C.E.M.A. MATERIALS LAB IN ACCORDANCE WITH THE NUMBER, LOCATION, AND FRENQUECY REQUESTED BY THE O.C.E.M.A. INSPECTOR.
11. A PERMIT FOR WORK WITHIN EXISTING STREET RIGHT OF WAY IS REQUIRED FROM THE O.C.E.M.A. FOR ANY ENCROACHMENT NECESSARY FOR CONSTRUCTION IN PUBLIC RIGHT OF WAY.
12. ALL REINFORCING BARS MUST BE SECURELY HELD IN PLACE IN THE FORMS TWO WAY MATS OF STEEL MUST BE WIRED TOGETHER BOTH WAYS AL ALTERNATE INTERSECTIONS.
13. STORM DRAIN BACKFILL FOR ALL FACILITIES WITHIN STREET RIGHT OF WAY IS TO BE PLACED AND COMPACTED UNDER O.C.E.M.A. INSPECTION AND MEET OR EXCEED O.C.E.M.A. MINIMUM STANDARDS.
14. ALL PIPE IS TO BE BANDED AND GROUTED.
15. R.C.P. SHALL COMPLY WITH ALL A.S.T.M. APPLICABLE STANDARDS.
16. ALL CATCH BASINS AND LOCAL DEPRESSIONS SHALL BE CONSTRUCTED PER STREET IMPROVEMENT PLANS IN ACCORDANCE WITH O.C.E.M.A. STANDARD PLANS.
17. THE CONTRACTOR SHALL CONDUCT CONSTRUCTION OPERATIONS IN SUCH A MANNER THAT STORM OR OTHER WATERS MAY PROCEED UNINTERUPTED ALONG THEIR EXISTING STREET OR DRAINAGE COURSES.

NOTICE TO CONTRACTOR:
CONTRACTOR AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY. THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS; AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD THE OWNER, THE ENGINEER, AND THE COUNTY OF ORANGE HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING FOR LIABILITY ARISING FROM SOLE NEGLIGENCE OF OWNER, ENGINEER, OR COUNTY OF ORANGE.

NOTE: PRIOR TO CONSTRUCTION OF ANY CONCRETE STRUCTURE, THE CONCRACTOR SHALL VERIFY WITH THE SOILS ENGINEER, THE TYPE OF CONCRETE RECOMMENDED.

EXISTING UNDERGROUND STRUCTURES

THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES OR CONDUITS SHOWN ON THESE PLANS ARE OBTAINED BY A SEARCH OF THE AVAILABLE RECORDS. TO THE BEST OF OUR KNOWLEDGE, THERE ARE NO EXISTING UTILITIES EXCEPT AS SHOWN ON THESE PLANS. THE CONTRACTOR IS REQUIRED TO TAKE THE PRECAUTIONARY MEASURES TO PROTECT THE UTILITY LINES SHOWN AND ANY OTHER LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE OWNERS OF THE UTILITIES OR STRUCTURES CONCERNED BEFORE STARTING WORK. CONTRACTOR FURTHER ASSUMES ALL LIABILITY AND RESPONSIBILITY FOR THE UNDERGROUND UTILITY PIPES, CONDUITS OR STRUCTORS SHOWN OR NOT SHOWN ON THESE PLANS.

REGISTERED PROFESSIONAL ENGINEER
DOUGLAS SNYDER
NO. 24068
CIVIL
STATE OF CALIFORNIA

NOTICE TO CONTRACTOR:
CONTRACTOR SHALL VERIFY ALL CONDITIONS AND DIMENSIONS AND SHALL REPORT ALL DISCREPANCIES TO THE ENGINEER PRIOR TO THE COMMENCEMENT OF WORK.

E. PARNELL 12-85	E. PARNELL 12-85	
DESIGNED BY DATE	DRAWN BY DATE	CHECKED BY DATE

BENCHMARK

ALUMINUM CAP STAMPED 3E-61-71 ABOUT 1 MI. N.W. ALONG TRABUCO RD., FROM INT. OF EL TORO RD. & ABOUT 0.2 MI. N.W. ALONG TRABUCO RD.; FROM INT. OF CANADA RD. TO CONCRETE BRIDGE OVERCROSSING OF SERRANO CREEK, 16' N.E. OF CENTERLINE OF TRABUCO. SET IN TOP OF N.E. END OF CONC. RETAINING WALL OF BRIDGE. LEVEL WITH ROD.
ELEV. 444.561 1970 ADJ.

BASIS OF BEARINGS:

THE BEARINGS SHOWN HEREON ARE BASED ON THE EASTERLY LINE OF TRACT NO. 9110 BEING N.11 05'40"W. AS SHOWN ON A MAP FILED IN BOOK 391, PAGES 45, 46, 47 & 48, OF MISCELLANEOUS MAPS, RECORDS OF ORANGE COUNTY, CALIFORNIA. SAID BEARING BEING ROTATED COUNTERCLOCKWISE 0 00'21" FOR THE PURPOSE OF THIS PLAN.

NO.	REVISIONS	SHT.	APPROVED	DATE
2	REVISED ARCHITECTURAL PAVING DETAIL PER 'AS BUILT' CONDITIONS	3	AS BUILT	
1	REVISED STREET GRADE W'LY INTERSECTION	7	J.M. Evans	12/21/87

NO.	L.A.W.D. REVISIONS	APPROVED	DATE

LOS ALISOS WATER DISTRICT

LOS ALISOS WATER DISTRICT FOR WATER AND SEWER IMPROVEMENTS	LOS ALISOS WATER DISTRICT FOR WATER AND SEWER OPERATION
Warren D. Lobo RCE 24533 — 4/24/86 DATE	E. T. McFadden Jr. — 4/24/86 DATE
	GENERAL MANAGER

PREPARED BY
HUNSAKER AND ASSOCIATES INC.
THREE HUGHES
IRVINE, CA. 92718
(714) 855-3600
Douglas Snyder — 1-6-86
DOUGLAS SNYDER R.C.E. 24068 DATE

EXPIRATION DATE 12-31-89

DEVELOPER
WARMINGTON DEV. CO.
3090 PULLMAN
COSTA MESA, CA. 92626
(714) 557-5511

FIRE PROTECTION APPROVAL
ORANGE COUNTY FIRE DEPARTMENT — 1-5-86 DATE

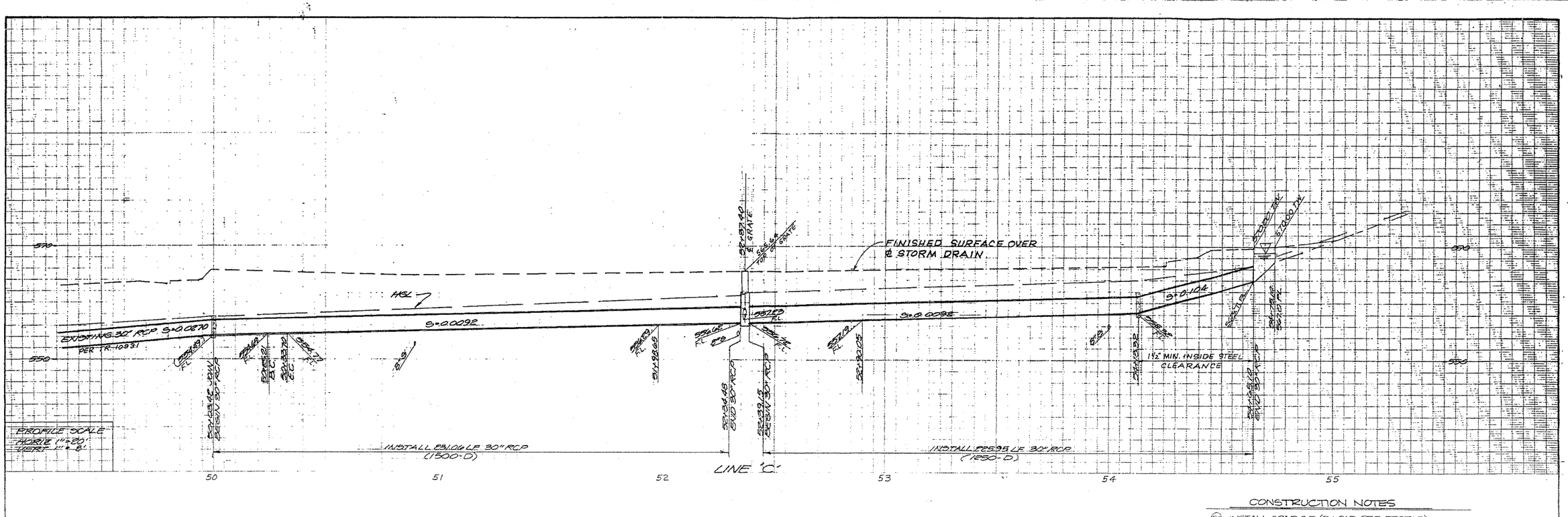
COUNTY OF ORANGE
E.M.A. TRAFFIC ENGINEERING DIVISION
APPROVED
BY: Steven M. Hogan — 29260 (3/87) R.C.E. — 5/9/86 DATE
THIS PLAN IS SIGNED BY E.M.A.T.E.D. FOR CONCEPT AND ADERENCE TO COUNTY SIGNING AND STRIPING STANDARDS AND REQUIREMENTS ONLY. E.M.A.T.E.D. IS NOT RESPONSIBLE FOR DESIGN ASSUMPTIONS OR ACCURACY.

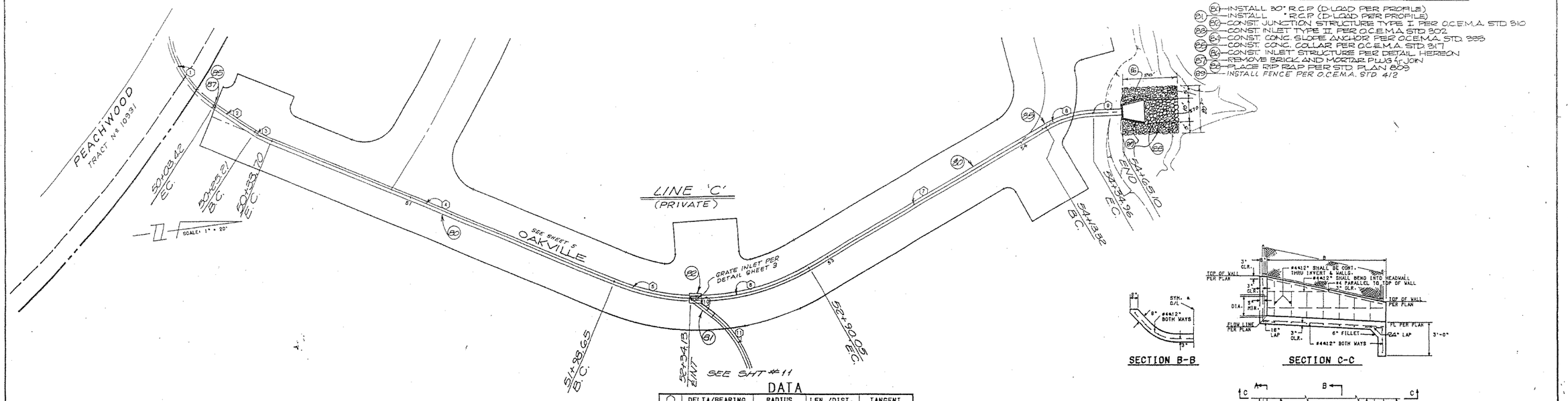
COUNTY OF ORANGE
E.M.A. REGULATION DIVISION
APPROVED
BY: Douglas N. Orange — 23796 R.C.E. — 5-29-1986 DATE
THIS PLAN IS SIGNED BY E.M.A./REGULATION FOR CONCEPT AND ADHERENCE TO COUNTY STANDARDS AND REQUIREMENTS ONLY. E.M.A./REGULATION IS NOT RESPONSIBLE FOR DESIGN ASSUMPTIONS, OR ACCURACY.

IMPROVEMENT PLANS
TRACT 12603
PORTION OF TRACT 10931
LOTS 7, 8 & 9
SHEET NO. 1 OF 12 SHEETS

W.O. 107-12603 BM (2933) 475A

175(20-24)PF: 12174.16 24-Aug-84 02:56 PM / 061-12174-650





CONSTRUCTION NOTES

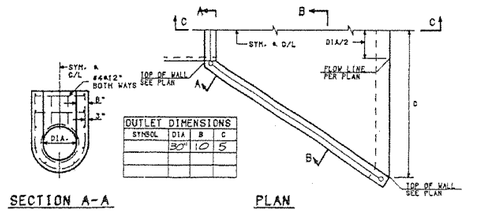
(24) INSTALL 30" R.C.P (D-LOAD PER PROFILE)
(21) INSTALL " R.C.P (D-LOAD PER PROFILE)
(20) CONST. JUNCTION STRUCTURE TYPE I PER O.C.E.M.A. STD 310
(22) CONST. INLET TYPE II PER O.C.E.M.A. STD 302
(24) CONST. CONC. SLOPE ANCHOR PER O.C.E.M.A. STD 335
(25) CONST. CONC. COLLAR PER O.C.E.M.A. STD 341
(26) CONST. INLET STRUCTURE PER DETAIL HEREON
(27) REMOVE BRICK AND MORTAR PLUG & JOIN
(28) PLACE RIP RAP PER STD. PLAN 809
(29) INSTALL FENCE PER O.C.E.M.A. STD 4/2

HYDRAULIC DATA

LINE	STA to STA	Q_{10}	DIA	So	n	Do	Vc	Sc	Dn	Vn	Vf	Sf
C	50+03 – 50+25	52.5	30	0.0092	.013	2.33	11.0	0.014	full	—	—	0.0164
C	50+25 – 50+33	52.5	30	0.0092	.013	2.33	11.0	0.014	full	—	—	0.0164
C	50+33 – 51+98	52.5	30	0.0092	.013	2.33	11.0	0.014	full	—	—	0.0164
C	51+98 – 52+34	52.5	30	0.0092	.013	2.33	11.0	0.014	full	----	—	0.0164
C	52+34 – 52+90	43.3	30	0.0092	.013	2.20	9.46	.010	full	8.82	8.82	0.0111
C	52+90 – 54+13	43.3	30	0.0092	.013	2.20	9.46	.010	full	8.82	8.82	0.0111
C	54+13 – 54+65	43.3	30	0.104	.013	2.20	9.46	.010	0.98	24.12	8.82	0.0111

DATA

	DELTA/BEARING	RADIUS	LEN./DIST.	TANGENT
1	(85°37'33")	(45.00)	(67.25)	(41.69)
2	N 40°14'28"E		21.79	
3	10°48'28"	45.00	8.49	4.26
4	N 29°26'00"E		164.95	
5	20°19'43"	100.00	35.48	17.93
6	32°02'17"	100.00	55.92	28.71
7	N 22°56'00"W		123.27	
8	27°33'15"	45.00	21.64	11.03
9	N 04°37'15"E		30.14	
10	N 43°56'53"E		12.85	
11	33°21'02"	45.00	26.19	13.48



(36) INLET DETAIL
NO SCALE

SHEET 10 OF SHEETS 12
TRACT 12803

(2938) 475A

THOMPSON BLODGETT 8/1990

STORM DRAIN PLANS LOTS 7 & 9, - 36&E20.3 JPF: 12803 626 14-Mar-88 07:31 / 188-10931-850

Appendix C

Geotechnical Study dated September 30, 2004
Geotechnical Letter dated July 19, 2011

LIMITED PRELIMINARY GEOTECHNICAL INVESTIGATION SERRANO HIGHLANDS TENTATIVE TRACT 15594 CITY OF LAKE FOREST, CALIFORNIA

FOR

MADISON INVESTORS, L.P.
23201 MILL CREEK ROAD, SUITE 130
LAGUNA HILLS, CALIFORNIA 92653

W.O. 4414-A1-OC SEPTEMBER 30, 2004

GeoSoils, Inc.

Geotechnical • Coastal • Geologic • Environmental

W.O. 0245-9

LIMITED PRELIMINARY
GEOTECHNICAL INVESTIGATION
SERRANO HIGHLANDS
TENTATIVE TRACT 15594
CITY OF LAKE FOREST, CALIFORNIA
FOR
MADISON INVESTORS, L.P.
23201 MILL CREEK ROAD, SUITE 130
LAGUNA HILLS, CALIFORNIA 92653
W.O. 4414-A1-OC SEPTEMBER 30, 2004

GeoSoils, Inc.

Geotechnical • Coastal • Geologic • Environmental

1446 E. Chestnut Ave. • Santa Ana, California 92701 • (714) 647-0277 • FAX (714) 647-0745

September 30, 2004

W.O. 4414-A1-OC

Madison Investors, L.P.
23201 Mill Creek Road, Suite 130
Laguna Hills, California 92653

Attention: Mr. Gary Emsiek

Subject: Limited Preliminary Geotechnical Investigation, Serrano Highlands, Tentative Tract 15594, City of Lake Forest, California

Gentlemen:

In accordance with your request and authorization, this report presents the results of our Limited Preliminary Geotechnical Investigation of the subject site. The purpose of the study was to evaluate the onsite soils and geologic conditions and their effects on the proposed development from a geotechnical viewpoint.

EXECUTIVE SUMMARY

Based on our review of available data, limited field exploration, laboratory testing and geologic and engineering analyses, the proposed project appears suitable for its intended use from a geotechnical viewpoint, provided the recommendations presented in the text of this report are implemented during design and construction phases of the project.

- Removal of colluvial and alluvial deposits and weathered bedrock materials will be necessary prior to fill placement. For preliminary planning purposes, these depths are estimated to be 2± to 35± feet.

- Our review indicates no known active faults are crossing the project area, and the site is not within an (Alquist-Priolo) Earthquake Fault Zone.

- In general, and based upon data from our borings, groundwater is not expected to be a major factor in development of the site.

- The majority of the bedrock is expected to be readily excavatable to the planned depths.

- Deep alluvial removals may be required beneath fills planned at the site's main drainage channel.

- As an alternative to the total alluvial removal (within Lots 52, 53, 68, 69 and 76) in the vicinity of the existing easement, structures could be supported by a deep foundation system, embedded into the competent bedrock. Minor potential for damage should, however, be expected within rear yard improvements on these lots.

- In order to minimize the potential for fill settlement, fill materials should be compacted as follows:

  Fill depth deeper than 30' ..... 93% of relative compaction

  Fill depth between 30' to surface ..... 90% of relative compaction

- Settlement monitoring should be expected for fill areas deeper than 30 feet and a settlement monitoring plan will be recommended when the site final grading plan becomes available.

- No adverse geologic features that would preclude project feasibility were encountered during our field investigation.

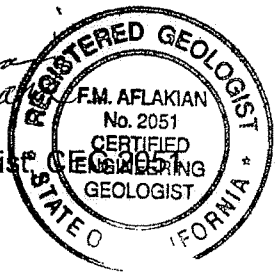
- The recommendations presented in this report should be incorporated into the design and construction considerations of the project.

The opportunity to be of service is greatly appreciated. If you should have any questions concerning this report or if we may be of further assistance, please do not hesitate to contact the undersigned.

Respectfully submitted,

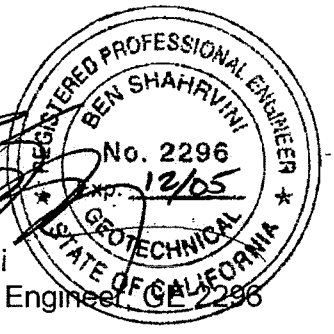
GeoSoils, Inc.

Fred Aflakian
Engineering Geologist CEG 2051



Reviewed by

Ben Shahrvini
Geotechnical Engineer GE 2296



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Distribution: (4) Addressee

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LIMITED PRELIMINARY GEOTECHNICAL INVESTIGATION
SERRANO HIGHLANDS, TENTATIVE TRACT 15594
CITY OF LAKE FOREST, CALIFORNIA

PURPOSE AND SCOPE OF STUDY

The purpose of this investigation was to obtain geotechnical data pertinent to the feasibility, planning, design and development of the site. This report provides preliminary recommendations for site preparation and grading, and preliminary design parameters. The scope of work completed for this geotechnical investigation has included the following activities:

1. Site reconnaissance and review of available soil and geologic data for the area.

2. Subsurface exploration consisting of the excavation, logging and sampling of six (6) exploratory borings.

3. Laboratory testing of samples collected during the field exploration for determination of classification, compaction characteristics, in-place density and moisture content, sulfate content, expansion index, and shear strength.

4. Engineering analyses of data collected with respect to the geotechnical planning and development of the site.

5. Preparation of this report.

This report includes a copy of the 40-scale Concept Grading Plan (Geological Map), which was prepared by Hunsaker and Associates, and is used as the base map for geotechnical data, and shows the approximate locations of exploratory borings (Plate 1), Geologic Cross-Section (Plates 2 & 3) References (Appendix A), Logs of Exploratory Borings (Appendix B), Laboratory Test Results (Appendix C), Seismic Analysis (Appendix D), and General Earthwork and Grading Guidelines (Appendix E).

SITE LOCATION AND DESCRIPTION

The site consists of two parcels of rectangular shaped land which are located at the northern end of Peachwood, in the City of Lake Forest, California (Figure 1). The smaller parcel is relatively flat, the larger parcel is a hilly site and topographically consists of a west-east trending ridge and associated tributaries. The slope ratios of the natural slopes range from 2:1 to 3:1 (h:v).

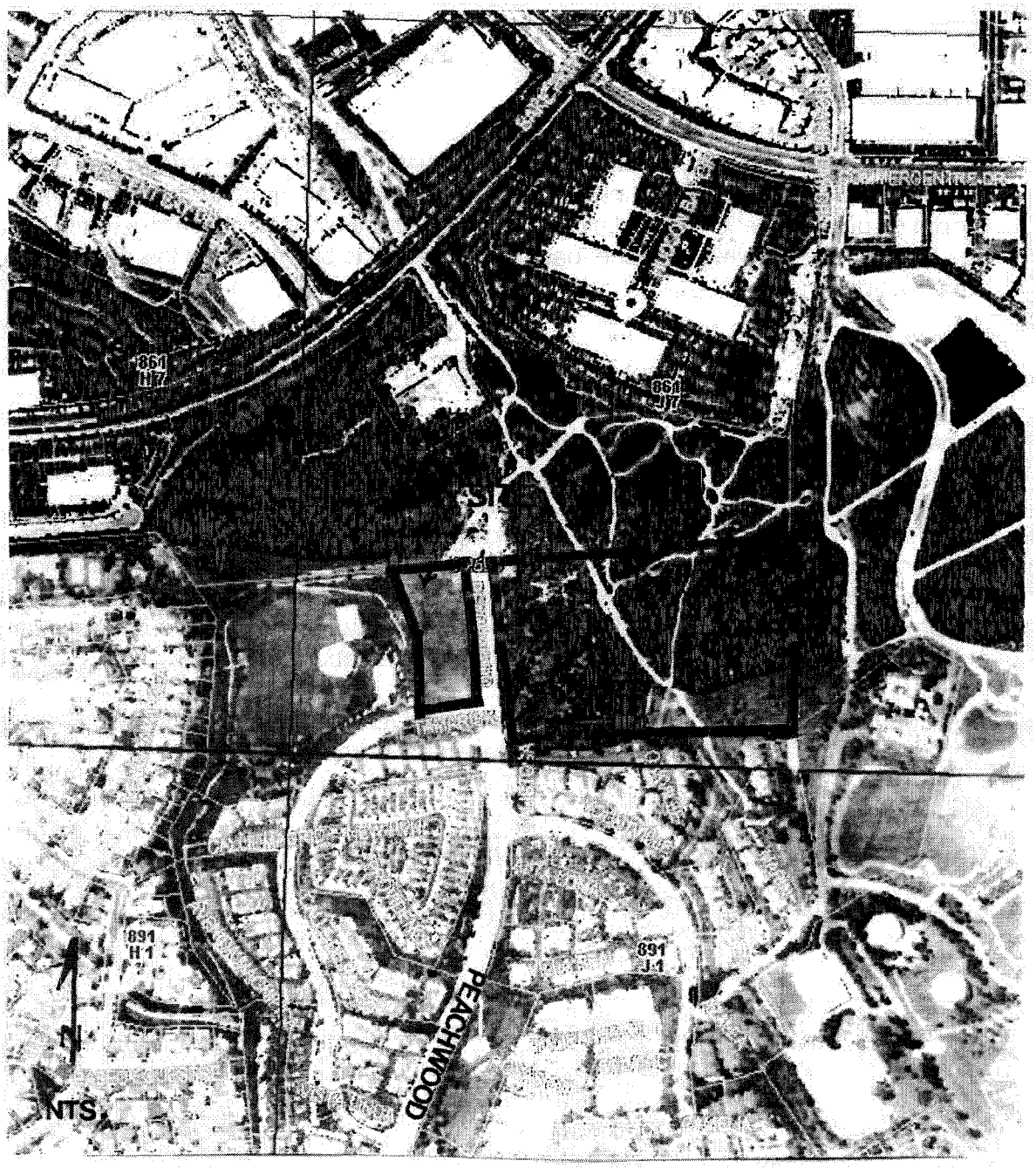

FIGURE 1

GeoSoils, Inc.

SITE LOCATION MAP

DATE 9-30-04 | W.O. NO. 4414-A1-OC

Geotechnical • Geologic • Environmental

PROPOSED DEVELOPMENT

Based on a review of the enclosed 40-scale Grading Plan (Plate 1), proposed development will consist of 83 one or two-story, single-family residences, and associated streets. Proposed grading will involve standard cut-fill grading procedures to create the proposed development. Maximum cut and fill slopes are planned at approximately 35 feet and 25 feet, respectively. Building loads are assumed to be typical for this relatively light construction.

SUBSURFACE EXPLORATION

Subsurface exploration was performed by GSI on August 30, 2004, and consisted of the excavation of six hollow stem borings to depths ranging from 10.8 to 41.5 feet below the surface. A GSI field geologist observed the excavation operations and collected bulk samples for visual examination and subsequent laboratory testing. Soils encountered in the borings were classified in general accordance with the Unified Soil Classification System (USCS), as described in Appendix B, Plate A. The Logs of the Exploratory Borings are presented in Appendix B and are based on visual examination of the samples, cuttings obtained during excavation operations, and results of laboratory tests.

The approximate locations of the exploratory excavations are shown on the Geological Map (Plate 1). The Logs of Borings are presented in Appendix B.

SITE GEOLOGY

Earth Materials

Colluvium (map symbol: Qc)

Colluvial material consisted of silty sand, brown to grayish brown, slightly moist, porous and subject to consolidation. This material was mapped where thicknesses are greater than 4 feet (see Plate 1).

Alluvium (map symbol: Qal)

Alluvial material consisted of silty sand, medium brown to grayish brown, slightly moist to moist and medium dense in consistency. These materials are subject to consolidation and not suitable for structural support.

Capistrano Formation, Oso Member (map symbol: Tso)

Sandstone of the Capistrano Formation, Oso Member, has been mapped throughout the site. This unit is characteristically light gray to white in color, and structurally massive. The sandstone is generally moderately hard and can locally be friable as well as cemented. The materials vary from silty fine sandstone to coarse grained sandstone.

FAULTING AND REGIONAL SEISMICITY

No known active or potentially active faults are shown crossing the site on published maps reviewed (Jennings, 1994). No evidence for active or potentially active faulting was encountered in any of our exploratory borings performed during this evaluation or in referenced reports reviewed for this study.

There are a number of faults in the southern California area which are considered active and will have an effect on the site in the form of moderate to strong ground shaking, should they be the source of an earthquake. These include, but are not limited to: the San Andreas fault, the Elsinore-Glen Ivy fault, the Chino-Central fault (approx.10.0 miles.), the Elsinore-Whittier fault, and the San Jose fault zone. The approximate location of these and other major faults relative to the site are presented in Appendix D. The possibility of ground acceleration or shaking at the site may be considered as approximately similar to the southern California region as a whole.

Historic Earthquakes

An historic earthquake analysis was performed for the project site using the computer program EQSEARCH (Blake, 2000b). To date, 168 earthquakes with Richter Magnitude 5.0 or greater have occurred within 100 kilometers of the site since the year 1800. Historically, the maximum site acceleration during this period has been calculated to be 0.246g, with a maximum Richter Magnitude of 7.6 (Appendix D).

Deterministic Evaluation

A deterministic seismic hazard analysis was performed for the project site using the computer program EQFAULT (Blake, 2000c). The closest fault to the site is the Chino-Central Ave. fault zone, which is approximately 10.0 miles away from the site. For this analysis we have selected the attenuation relationship of Boore, et al. (1997) for a site soil classification (average shear velocity = 250 m/sec). The largest maximum earthquake site acceleration anticipated at the site is 0.4716g assuming a maximum earthquake event of magnitude 6.7 (M_W) on the Chino-Central Ave. fault zone (Appendix D).

Probabilistic Evaluation

A probabilistic seismic hazard analysis was performed using the computer program FRISKSP (Blake, 2000c). The data presented in Appendix D was modified by one standard deviation of probability to accommodate the uncertainty (mean + 1). For this analysis we have selected the attenuation relationship of Boore, et al. (1997), for a site soil classification (average shear velocity = 250 m/sec), a fault search radius of 100 kilometers. This analysis indicates a ground acceleration of 0.4g for a 10% probability of occurrence in 50 years (Appendix D).

UBC Seismic Coefficients and Near Source Factors

In accordance with the 1997 UBC, the seismic parameters to be considered in the design are presented below:

Soil Profile (Table 16-J) = S_D
Seismic Zone (Figure 16-2) = 4
Seismic Zone Factor (Table 16-I) Z = 0.4
Seismic Source Type (Table 16-U) = B
Seismic Coefficient, C_a (Table 16-Q) = 0.44
Seismic Coefficient, C_v (Table 16-Q) = 0.64
Near Source Factor N_a (Table 16-S) = 1.0
Near Source Factor N_v (Table 16-T) = 1.0
Design Fault = Sierra Madre Fault
Source Distance = ±10 Miles

Seismic Hazards

The following list includes other seismic related hazards that have been considered during our evaluation of the site. The hazards listed are considered negligible and/or completely mitigated as a result of site location, soil characteristics and typical site development procedures:

- Surface Fault Rupture
- Ground Lurching or Shallow Ground Rupture

It is important to keep in perspective that in the event of a maximum probable or credible earthquake occurring on any of the nearby major faults, strong ground shaking would occur in the subject site's general area. Potential damage to any structure(s) would likely be greatest from the vibrations and impelling force caused by the inertia of a structure's mass than from those induced by the hazards considered above. This potential would be no greater than that for other existing structures and improvements in the immediate vicinity.

Our field observations and review of readily available geologic data indicate that active faults do not cross the site.

Experience has shown that wood frame structures designed in accordance with the Uniform Building Code tend to best resist earthquake effects. Earthquake effects may include lurching and/or localized ground cracking. This would be expected over other portions of southern California.

LANDSLIDES

No landslides were encountered during the course of our subsurface investigation. In addition, topographic landforms were not suggestive of landslides in the field.

GROUNDWATER

Groundwater was not encountered in GSI's exploratory borings for the current study and is not anticipated to adversely affect the site development. These observations reflect site conditions at the time of this investigation and do not preclude changes in local groundwater conditions in the future from natural causes or from damaged structures (pools, pipes, etc.), heavy irrigation or altered site drainage pattern(s).

LIQUEFACTION

Liquefaction describes a phenomenon in which cyclic stresses, produced by earthquake-induced ground motion, create excess pore pressures in relatively cohesionless soils. These soils may thereby acquire a high degree of mobility, which can lead to lateral movement, sliding, consolidation and settlement of loose sediments, sand boils and other damaging deformations. This phenomenon occurs only below the water table; but after liquefaction has developed, it can propagate upward into overlying non-saturated soil, as excess pore water dissipates. Groundwater was not observed in GSI's borings and all susceptible alluvial materials to liquefaction will be removed and replaced with compacted fill materials.

RIPPABILITY

The underlying alluvium and bedrock materials on site are not anticipated to pose any excavation difficulties during grading. However, isolated hard lenses are common within the Capistrano Formation and Oso Member.

LABORATORY TESTING

General

Laboratory tests were performed on representative samples of the onsite earth materials encountered in order to evaluate their physical characteristics. The test procedures used and results obtained are presented below and in Appendix C. Additional testing will be required at the completion of site grading to determine the as-graded soil conditions as they relate to foundation design.

Moisture-Density Relations

The laboratory maximum dry density and optimum moisture content for the representative site soils were determined according to test method ASTM D-1557. Results of this testing are presented in Appendix C.

Expansion Potential

An expansion index test was performed on a representative sample of the site soil in general accordance with the 1997 Uniform Building Code Standard 18-2. The result is presented in the following table:

LOCATION	EXPANSION INDEX	EXPANSION POTENTIAL
B-1 @ 5'	5	Very Low

Sulfate Test

A test was conducted according to Caltrans Method 417 to determine soluble sulfate content of onsite soil. The test result is presented in the following table:

LOCATION	SOLUBLE SULFATE IN WATER (% By Weight)
B-1 @ 5'	0.001

Additional sulfate and expansion potential testings should be performed at the completion of site grading and prior to the start of construction.

Consolidation Testing

Consolidation tests were performed on selected undisturbed samples. Testing was performed in general accordance with ASTM Test Method D-2435-90. Test results are presented in Appendix C.

Shear Testing

Shear testings were performed on remolded and natural soil samples in a strain control-type direct shear machine. Remolded samples were remolded to 90 percent of relative compaction. Testing was performed in general accordance with ASTM Test Method D-3080-90. Results of this testing are presented in Appendix C.

Corrosivity

One corrosivity test was performed and collected from the site. The test was performed in accordance with the CalTrans Test Methods 422 and 532. Results of this testing are presented in Appendix C.

CONCLUSIONS

Based on the field exploration, laboratory testing and engineering and geological analysis, it is GSI's opinion that the site is suitable for the proposed development from geotechnical engineering and geologic viewpoints, provided that the recommendations presented herein are incorporated into the design and construction phases of site development.

The geologic and engineering analyses performed concerning site preparation, and the recommendations presented herein, have been completed using the information provided. In the event that any significant changes are made to proposed site development, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the recommendations of this report are verified or modified in writing by this office.

EARTHWORK CONSTRUCTION RECOMMENDATIONS

General

Grading should be accomplished under the observation and testing of the project soils engineer in accordance with the recommendations contained herein, the applicable grading ordinance of the City of Lake Forest where applicable, and GSI's "General Earthwork and Grading Guidelines" included herein as Appendix E.

Site Preparation and Grading

During earthwork construction, all removals and the general grading procedures should be observed and the fill selectively tested by a representative of GSI. Oversized material (>6" diameter) if encountered, should be separated and not placed in foundation areas with compacted fills. If unusual or unexcepted conditions are exposed in the field, they should be reviewed by this office, and, if warranted, modified and/or additional recommendations offered. All applicable requirements of the California Construction and General Industry Safety Order, the Occupational Safety and Health Act and the Construction Safety Act should be met.

Clearing and Grubbing

Prior to initiating the grading operation, all existing surficial vegetation, debris and other deleterious material should be removed from the site.

Removals

In areas to receive compacted fill, unsuitable surficial materials (including existing colluvium, alluvium and weathered bedrock) should be removed to competent materials as directed by the project geotechnical consultant or his/her field representatives (referred to herein as the geotechnical consultant). The depths of removal, as estimated from our study, generally vary from 2± to 35± feet. However, deeper removals in unexplored areas are possible.

Transition Lots

All geological transition lots should be capped with a minimum of 3 feet of compacted fill. In order to establish a uniform subgrade beneath any proposed foundations or materials of differing expansion potential, the cut portions of cut/fill transition lots/pads should be overexcavated a minimum of 3 feet and replaced with compacted fill. (This could be deepened based on proposed construction and/or exposed soil conditions.) Prior to replacing the overexcavated area with compacted fill, the exposed bedrock should be well scarified to a minimum depth of 6 inches, brought to at least optimum moisture content, and compacted to a minimum relative compaction of 90 percent of the laboratory standard. Since lot grades are not currently shown on site plans, overexcavation of transition lots will be determined when site plans become finalized, based on conditions exposed.

Stability of Temporary Excavations

The possibility of temporary excavations failing during grading may be minimized by keeping the time between cutting and filling operations to a minimum, limiting the maximum width of cut slope exposed at any one time, and cutting no steeper than a 1:1 gradient.

Fill Placement

Subsequent to completing the recommended removals and overexcavation, the excavated onsite soils that are free of vegetation and debris may be placed in relatively thin lifts (up to 8± inches loose), brought to at least optimum moisture content and compacted to a minimum relative compaction of 90 percent of the laboratory standard (ASTM D-1557).

Benching

Fills placed on slopes steeper than 5:1 (h:v) should be keyed and benched into competent material as the fill is placed. Keys and benches should be observed by the geotechnical engineer or engineering geologist. Typical benching details have been included in Appendix E.

Fill Slopes

All the fill slopes are designed at gradients no steeper than 2:1 (h:v). Fill slopes toeing on natural slopes require a minimum keyway of 15 feet or 1/2 of the slope height (whichever is greater). The keyway should be at least 2 feet into competent fill or bedrock materials. The importance of proper fill slope compaction cannot be overemphasized. In order to achieve proper compaction, one or more of the four following methods should be employed by the contractor following implementation of typical slope construction guidelines: 1) track walking the slope at grade, 2) gridroll the slope, 3) use a combination of a sheepsfoot roller and track walking, or 4) overfill the slopes 3 to 5 feet laterally and cut them back to grade to expose the compacted core. Random testing should be performed to verify compaction to the face of the slope.

Cut Slopes

The planned cut slopes are 2:1 (h:v) or flatter. The presence of any adverse geologic structures and need for cut slope stabilization should be further evaluated by the project engineering geologist during grading so that mitigative measures can be provided, if warranted.

Stabilization Fill Slopes

Some anticipated cut slopes within the subject project areas may locally require stabilization fills, although none are anticipated at this time. The backcuts for stabilization fills are recommended to be constructed at a minimum (i.e., no steeper than) inclination of 1:1 (h:v). Stability fills, if necessary, are to be at least 20 feet wide to the top of slopes and will require subdrains, including backdrains, etc., as indicated in Appendix D.

Subdrainage

Subdrains should be anticipated for canyon cleanouts and retaining wall backcuts. Preliminary locations and extent of subdrains should be determined based on a review of final construction plans. Actual locations and extent of subdrains should be determined during grading by the project geotechnical consultant. The general construction details of subdrain placement are shown in Appendix D.

Earthwork Balance

The volume change of excavated material upon compaction as engineered fill will vary with material type and location. It is anticipated that the bedrock materials will not subside due to the static and dynamic loading conditions imposed by earthwork equipment. The earthwork shrinkage/bulking factors for removed material may be approximated by using the following parameters:

Colluvium	10% to 15% shrinkage
Alluvium	5% to 10% shrinkage
Bedrock	5% to 10% bulking

The above factors are based on in-situ density testing performed during the field exploration phase of our evaluation, and our experience on similar, nearby projects.

Stability of Temporary Cut Slopes for Retaining Walls

The stability of temporary excavations depends on many factors, including the slope angle, the shearing strength of the existing fill material, and the height of the slope and the length of time the excavation remains unsupported and exposed to equipment vibrations and rainfall. All excavations should be observed by the engineering geologist during excavation.

The possibility of temporary excavations failing may be minimized by: 1) keeping the time between cutting and filling operations to a minimum; 2) limiting excavation length exposed at any one time; and, 3) cutting no steeper than a 1:1 (h:v) inclination.

The above information is intended to minimize the risk of temporary excavation failure, but does not guarantee one will not occur. Although not expected, any liability, risk or cost imposed by excavation failure is accepted as inherent in the construction of the proposed improvements between the contractor and the developer, and, as such, their parties are duly notified that, although unlikely, this may occur, and all safety precautions should be utilized.

FOUNDATION DESIGN RECOMMENDATIONS

General

This report presents minimum design criteria for the design of slabs, foundations and other elements possibly applicable to the project. These criteria should not be considered as substitutes for actual designs by the structural engineer. The structural engineer should analyze actual soil-structure interaction and consider, as needed, bearing, expansive soil influence, and strength, stiffness and deflections in the various slab, foundation, and other elements in order to develop appropriate, design-specific details. As conditions dictate, it is possible that other influences will also have to be considered. The structural engineer should consider all applicable codes and authoritative sources where needed. If analyses by the structural engineer result in less critical details than are provided herein as minimums, the minimums presented herein should be adopted. It is considered likely that some, more restrictive details will be required. If the structural engineer has any questions or requires further assistance, please do not hesitate to call or otherwise transmit his requests.

Based upon our observations and previous test data, the onsite soils are very low to low in expansion potential (per Table 18-I-B of the 1997 UBC). The following preliminary foundation construction recommendations are presented for planning purposes. Final foundation construction recommendations should be based on expansive soil tests performed after earthwork construction. If materials with an expansion index of 20 or higher are placed near finish grade elevations, then an effective plasticity index should be recommended for the upper 15 feet (per Section 1815.4.2 of the 1997 UBC). For preliminary purposes, an effective plasticity index of 60, and an unconfined compressive strength coefficient of 2 may be used.

Conventional Foundation Design

Conventional spread and continuous footings may be used provided they are founded entirely in properly compacted fill or bedrock.

An allowable bearing value of 1,500 psf may be used for design of footings which maintain a minimum width of 12 inches (15 inches for two-story buildings) for continuous footings and 24 inches for isolated footings and a minimum depth of at least 12 inches (18 inches for two-story building) into the properly compacted fill or bedrock. The bearing value may be increased by one-third for seismic or other temporary loads.

For lateral sliding resistance, a coefficient of friction of 0.35 may be utilized for a concrete to soil contact when multiplied by the dead load.

Passive earth pressure may be computed as an equivalent fluid having a density of 250 psf per foot of depth, to a maximum earth pressure of 2,000 psf.

When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one-third.

Building Setbacks From Slopes

Building setbacks from the tops and toes of slopes should minimally comply with the 1997 UBC. However, the required setback from the tops of the slopes could be reduced by deepening the building footings.

Settlement

The structures within the fill areas should be designed to withstand a total and differential settlement of 2.0 inches and 1.0 inch over a 40-foot horizontal span, respectively.

FOUNDATION CONSTRUCTION RECOMMENDATIONS

General

Based upon our observations and test data, the building pad areas are anticipated to have very low expansion potential. The following preliminary foundation construction recommendations are presented for planning purposes. Final foundation construction recommendations should be based on expansive soil tests performed after earthwork construction.

Very Low Expansive Soils (E.I. from 0-20)

1. Interior and exterior footings should be founded at a minimum depth of 12 inches below the lowest adjacent ground surface. Exterior footings for two-story construction should be founded at a minimum depth of 18 inches (12 inches of workshop building). All continuous footings should be reinforced with a minimum of 4 No. 4 reinforcing bars, two placed near the top and two placed near the bottom footing. Isolated and continuous footings should be minimally reinforced per structural requirements.

2. Concrete slabs in moisture-sensitive areas should be underlain with 2 inches of washed sand or crushed rock. In addition, a vapor barrier consisting of a minimum of six mil visqueen with all laps sealed should be provided. One inch of the sand should be placed over the membrane to aid in uniform curing of the concrete.

3. Concrete slabs should be a minimum of 4 inches (full) thick and be reinforced with No. 3 bars on 18-inch centers, both ways, or the equivalent. All slab reinforcement should be properly supported to ensure the desired placement near mid-height in the slab.

4. Moisture conditioning of subgrade is recommended for these soil conditions. The moisture condition of each slab area should be at least 110 percent of optimum and be verified by this office to a depth of 18 inches below slab grade prior to placement of concrete.

5. The reinforcing recommendations presented above reflect the design criteria from a soils engineering viewpoint. Architectural and structural engineering specifications, which exceed our recommendations, should prevail.

WALL DESIGN PARAMETERS

Conventional Retaining Walls

The design parameters provided below assume that either non-expansive soils (Class 2 permeable filter material or Class 3 aggregate base) or native materials (with an expansion index of up to 65) are used to backfill any retaining walls. The type of backfill (i.e., select or native), should be specified by the wall designer, and clearly shown on the plans. Building walls, below grade, should be water-proofed or damp-proofed, depending on the degree of moisture protection desired. The foundation system for the proposed retaining walls should be designed in accordance with the recommendations presented in this and preceding sections of this report, as appropriate. Footings should be embedded a minimum of 18 inches below adjacent grade (excluding landscape layer, 6 inches) and should be 24 inches in width. There should be no increase in bearing for footing width. Recommendations for specialty walls (i.e., crib, earthstone, geogrid, etc.) can be provided upon request, and would be based on site specific conditions.

Restrained Walls

Any retaining walls that will be restrained prior to placing and compacting backfill material or that have re-entrant or male corners, should be designed for an at-rest equivalent fluid pressure (EFP) of 65 pounds per cubic foot (pcf), plus any applicable surcharge loading. For areas of male or re-entrant corners, the restrained wall design should extend a minimum distance of twice the height of the wall (2H) laterally from the corner.

Cantilevered Walls

The recommendations presented below are for cantilevered retaining walls up to 10 feet high. Design parameters for walls less than 3 feet in height may be superseded by City and/or County standard design. Active earth pressure may be used for retaining wall

design, provided the top of the wall is not restrained from minor deflections. An equivalent fluid pressure approach may be used to compute the horizontal pressure against the wall. Appropriate fluid unit weights are given below for specific slope gradients of the retained material. These do not include other superimposed loading conditions due to traffic, structures, seismic events or adverse geologic conditions. When wall configurations are finalized, the appropriate loading conditions for superimposed loads can be provided upon request.

SURFACE SLOPE OF RETAINED MATERIAL HORIZONTAL TO VERTICAL	EQUIVALENT FLUID WEIGHT P.C.F. (SELECT BACKFILL)	EQUIVALENT FLUID WEIGHT P.C.F. (NATIVE BACKFILL)
Level*	35	45
2 to 1	45	55
* Level backfill behind a retaining wall is defined as compacted earth materials, properly drained, without a slope for a distance of 2H behind the wall, where H is the height of the wall.		

Retaining Wall Backfill and Drainage

Positive drainage must be provided behind all retaining walls in the form of gravel wrapped in geofabric and outlets. A backdrain system is considered necessary for retaining walls that are 2 feet or greater in height. Backdrains should consist of a 4-inch diameter perforated PVC or ABS pipe encased in either Class 2 permeable filter material or ½-inch to ¾-inch gravel wrapped in approved filter fabric (Mirafi 140 or equivalent). For low expansive backfill, the filter material should extend a minimum of 1 horizontal foot behind the base of the walls and upward at least 1 foot. For native backfill that has up to medium expansion potential, continuous Class 2 permeable drain materials should be used behind the wall. This material should be continuous (i.e., full height) behind the wall, and it should be constructed in accordance with the enclosed Detail 1 (Typical Retaining Wall Backfill and Drainage Detail). For limited access and confined areas, (panel) drainage behind the wall may be constructed in accordance with Detail 2 (Retaining Wall Backfill and Subdrain Detail Geotextile Drain). Materials with an expansion index (E.I.) potential of greater than 90 should not be used as backfill for retaining walls. For more onerous expansive situations, backfill and drainage behind the retaining wall should conform with Detail 3 (Retaining Wall And Subdrain Detail Clean Sand Backfill).

Outlets should consist of a 4-inch diameter solid PVC or ABS pipe spaced no greater than ±100 feet apart, with a minimum of two outlets, one on each end. The use of weep holes in walls higher than 2 feet should not be considered. The surface of the backfill should be sealed by pavement or the top 18 inches compacted with native soil (E.I. $\leq$ 90). Proper surface drainage should also be provided. For additional mitigation, consideration should be given to applying a water-proof membrane to the back of all retaining structures. The use of a waterstop should be considered for all concrete and masonry joints.

DETAILS

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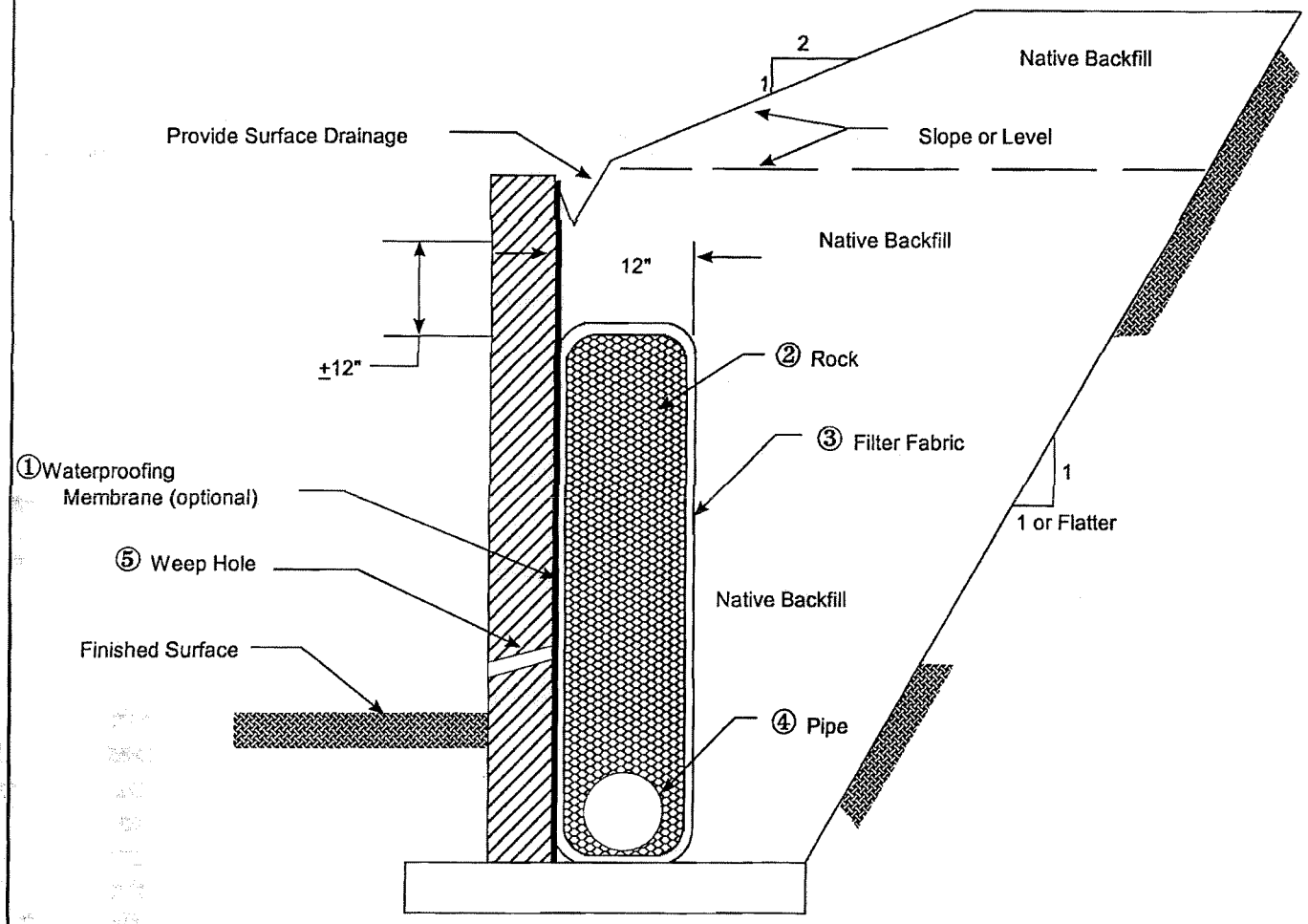

① WATERPROOFING MEMBRANE (optional):
Liquid boot or approved equivalent.

② ROCK:
3/4 to 1-1/2" (inches) rock.

③ FILTER FABRIC:
Mirafi 140N or approved equivalent; place fabric flap behind core.

④ PIPE:
4" (inches) diameter perforated PVC. schedule 40 or approved alternative with minimum of 1% gradient to proper outlet point.

⑤ WEEP HOLE:
Minimum 2" (inches) diameter placed at 20' (feet) on centers along the wall, and 3" (inches) above finished surface. (No weep holes for basement walls.)

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TYPICAL RETAINING WALL BACKFILL AND DRAINAGE DETAIL

DETAIL 1

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DETAILS
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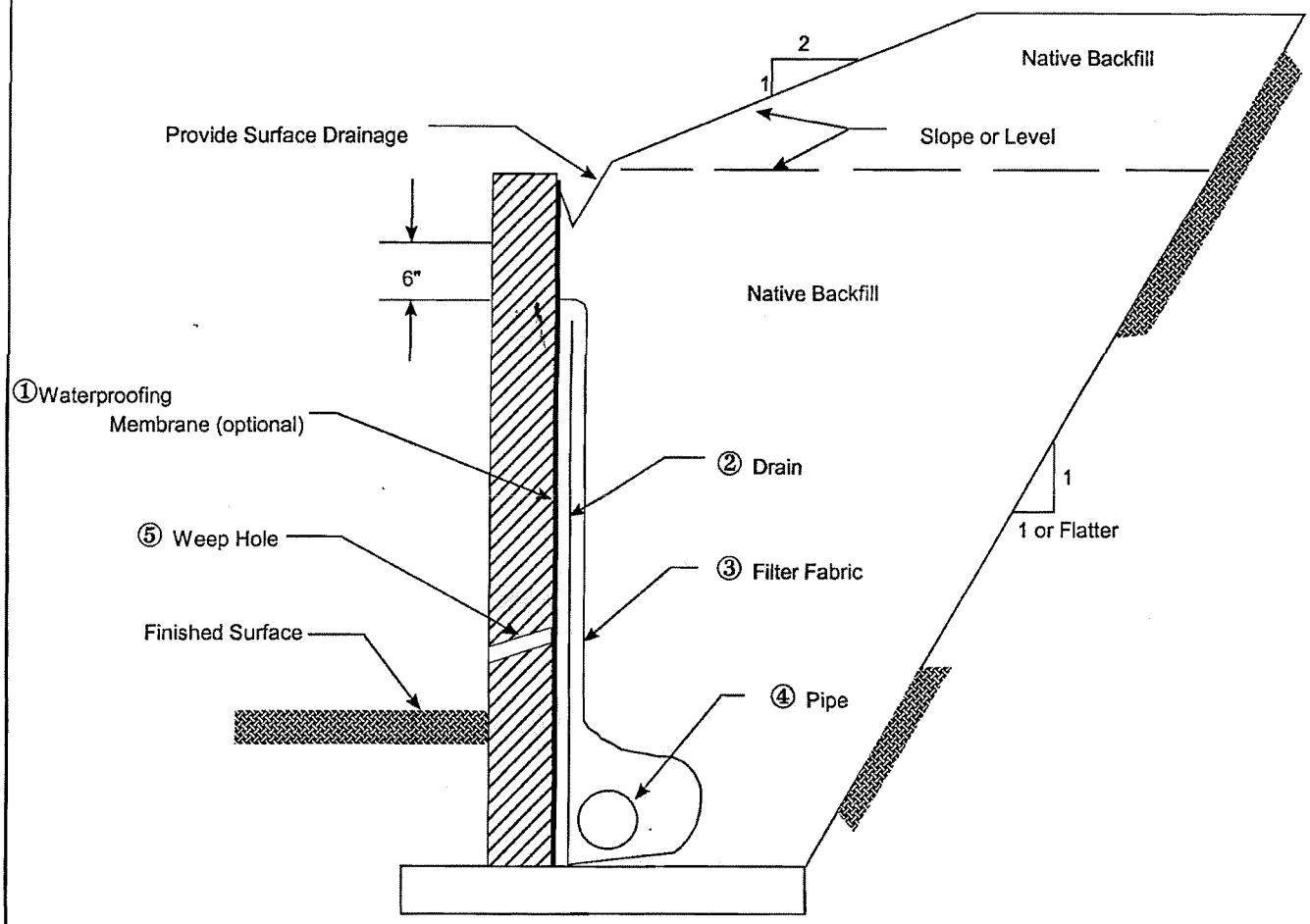

① WATERPROOFING MEMBRANE (optional):
Liquid boot or approved equivalent.

② DRAIN:
Miradrain 6000 or J-drain 200 or equivalent for non-waterproofed walls.
Miradrain 6200 or J-drain 200 or equivalent for waterproofed walls.

③ FILTER FABRIC:
Mirafi 140N or approved equivalent; place fabric flap behind care.

④ PIPE:
4" (inches) diameter perforated PVC. schedule 40 or approved alternative with minimum of 1% gradient to proper outlet point.

⑤ WEEP HOLE:
Minimum 2" (inches) diameter placed at 20' (feet) on centers along the wall, and 3" (inches) above finished surface. (No weep holes for basement walls.)

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RETAINING WALL BACKFILL AND SUBDRAIN DETAIL GEOTEXTILE DRAIN

DETAIL 2

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DETAILS

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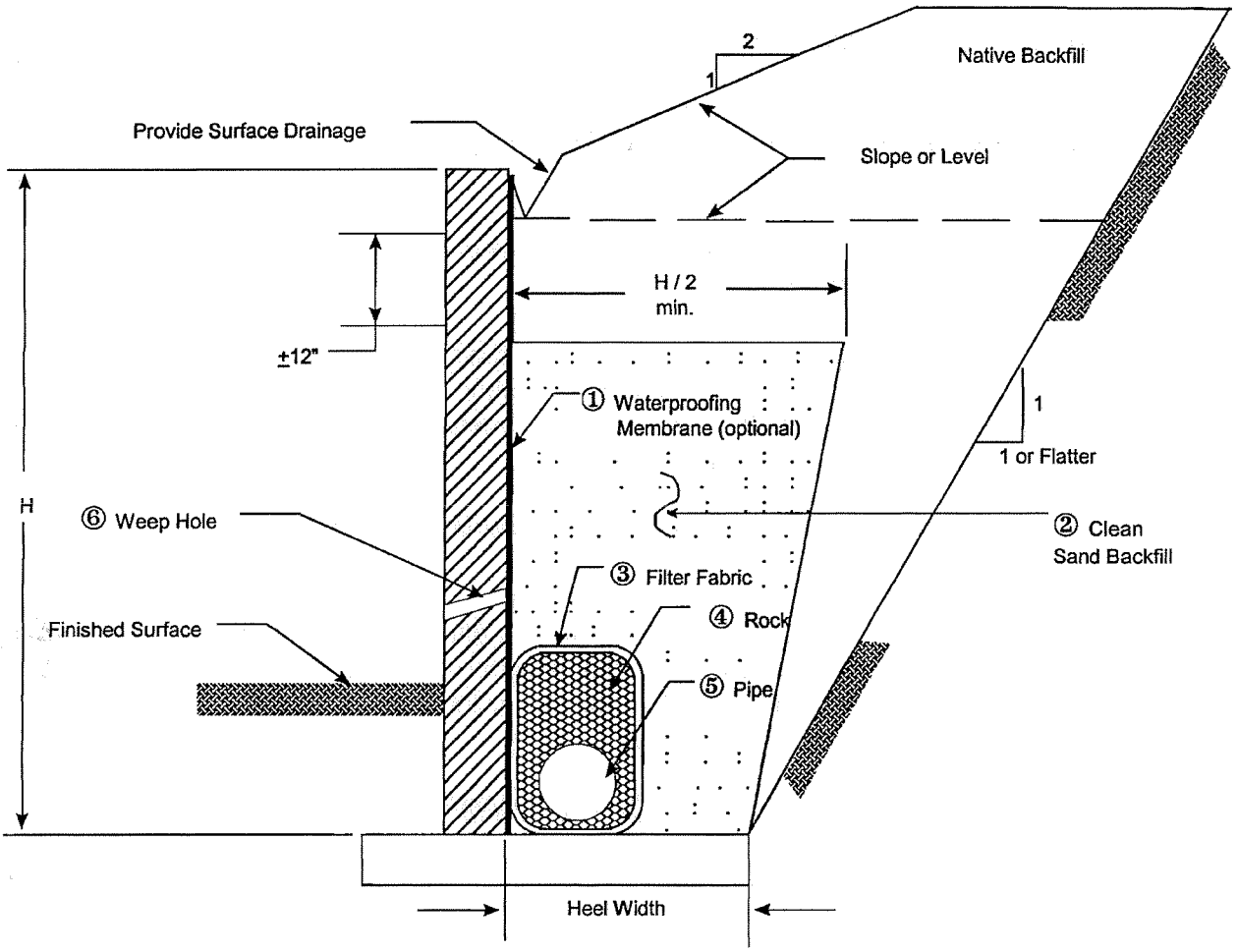

① **WATERPROOFING MEMBRANE (optional):**
Liquid boot or approved equivalent.

② **CLEAN SAND BACKFILL:**
Must have sand equivalent value of 30 or greater; can be densified by water jetting.

③ **FILTER FABRIC:**
Mirafi 140N or approved equivalent.

④ **ROCK:**
1 cubic foot per linear feet of pipe or 3/4 to 1-1/2" (inches) rock.

⑤ **PIPE:**
4" (inches) diameter perforated PVC. schedule 40 or approved alternative with minimum of 1% gradient to proper outlet point.

⑥ **WEEP HOLE:**
Minimum 2" (inches) diameter placed at 20' (feet) on centers along the wall, and 3" (inches) above finished surface. (No weep holes for basement walls.)

GeoSoils, Inc.

RETAINING WALL AND SUBDRAIN DETAIL
CLEAN SAND BACKFILL

DETAIL 3

Geotechnical • Coastal • Geologic • Environmental

Wall/Retaining Wall Footing Transitions

Site walls are anticipated to be founded on footings designed in accordance with the recommendations in this report. Should wall footings transition from cut to fill, the civil designer may specify either:

a) A minimum of a 2-foot overexcavation and recompaction of cut materials for a distance of 2H, from the point of transition.

b) Increase of the amount of reinforcing steel and wall detailing (i.e., expansion joints or crack control joints) such that a angular distortion of 1/360 for a distance of 2H on either side of the transition may be accommodated. Expansion joints should be sealed with a flexible, non-shrink grout.

c) Embed the footings entirely into native formational material (i.e., deepened footings).

If transitions from cut to fill transect the wall footing alignment at an angle of less than 45 degrees (plan view), then the designer should follow recommendation "a" (above) and until such transition is between 45 and 90 degrees to the wall alignment.

TOP-OF-SLOPE WALLS/FENCES/IMPROVEMENTS

Slope Creep

Soils at the site may be expansive and therefore, may become desiccated when allowed to dry. Such soils are susceptible to surficial slope creep, especially with seasonal changes in moisture content. Typically in southern California, during the hot and dry summer period, these soils become desiccated and shrink, thereby developing surface cracks. The extent and depth of these shrinkage cracks depend on many factors such as the nature and expansivity of the soils, temperature and humidity, and extraction of moisture from surface soils by plants and roots. When seasonal rains occur, water percolates into the cracks and fissures, causing slope surfaces to expand, with a corresponding loss in soil density and shear strength near the slope surface. With the passage of time and several moisture cycles, the outer 3 to 5 feet of slope materials experience a very slow, but progressive, outward and downward movement, known as slope creep. For slope heights greater than 10 feet, this creep related soil movement will typically impact all rear yard flatwork and other secondary improvements that are located within about 15 feet from the top of slopes, such as swimming pools, concrete flatwork, etc., and in particular top of slope fences/walls. This influence is normally in the form of detrimental settlement, and tilting of the proposed improvements. The dessication/swelling and creep discussed above continues over the life of the improvements, and generally

becomes progressively worse. Accordingly, the developer should provide this information to any homeowners and homeowners association.

Top of Slope Walls/Fences

Due to the potential for slope creep for slopes higher than about 10 feet, some settlement and tilting of the walls/fence with the corresponding distresses, should be expected. To mitigate the tilting of top of slope walls/fences, we recommend that the walls/fences be constructed on a combination of grade beam and caisson foundations. The grade beam should be at a minimum of 12 inches by 12 inches in cross section, supported by drilled caissons, 12 inches minimum in diameter, placed at a maximum spacing of 6 feet on center, and with a minimum embedment length of 7 feet below the bottom of the grade beam. The strength of the concrete and grout should be evaluated by the structural engineer of record. The proper ASTM tests for the concrete and mortar should be provided along with the slump quantities. The concrete used should be appropriate to mitigate sulfate corrosion, as warranted. The design of the grade beam and caissons should be in accordance with the recommendations of the project structural engineer, and include the utilization of the following geotechnical parameters:

Creep Zone: 5-foot vertical zone below the slope face and projected upward parallel to the slope face.

Creep Load: The creep load projected on the area of the grade beam should be taken as an equivalent fluid approach, having a density of 60 pcf. For the caisson, it should be taken as a uniform 900 pounds per linear foot of caisson's depth, located above the creep zone.

Point of Fixity: Located a distance of 1.5 times the caisson's diameter, below the creep zone.

Passive Resistance: Passive earth pressure of 300 psf per foot of depth per foot of caisson diameter, to a maximum value of 4,500 psf may be used to determine caisson depth and spacing, provided that they meet or exceed the minimum requirements stated above. To determine the total lateral resistance, the contribution of the creep prone zone above the point of fixity, to passive resistance, should be disregarded.

Allowable Axial Capacity:

Shaft capacity: 350 psf applied below the point of fixity over the surface area of the shaft.

Tip capacity: 4,500 psf.

DRIVEWAY, FLATWORK, AND OTHER IMPROVEMENTS

The soil materials on site may be expansive. The effects of expansive soils are cumulative, and typically occur over the lifetime of any improvements. On relatively level areas, when the soils are allowed to dry, the dessication and swelling process tends to cause heaving and distress to flatwork and other improvements. The resulting potential for distress to improvements may be reduced, but not totally eliminated. To that end, it is recommended that the developer should notify any homeowners or homeowners association of this long-term potential for distress. To reduce the likelihood of distress, the following recommendations are presented for all exterior flatwork:

1. The subgrade area for concrete slabs should be compacted to achieve a minimum 90 percent relative compaction, and then be presoaked to 2 to 3 percentage points above (or 110 percent of) the soils' optimum moisture content, to a depth of 18 inches below subgrade elevation. The moisture content of the subgrade should be verified within 48 hours prior to pouring concrete.

2. Concrete slabs should be cast over a relatively non-yielding surface, consisting of a 4-inch layer of crushed rock, gravel, or clean sand, that should be compacted and level prior to pouring concrete. The layer should wet-down completely prior to pouring concrete, to minimize loss of concrete moisture to the surrounding earth materials.

3. Exterior slabs should be a minimum of 4 inches thick. Driveway slabs and approaches should additionally have a thickened edge (12 inches) adjacent to all landscape areas, to help impede infiltration of landscape water under the slab.

4. The use of transverse and longitudinal control joints are recommended to help control slab cracking due to concrete shrinkage or expansion. Two ways to mitigate such cracking are: a) add a sufficient amount of reinforcing steel, increasing tensile strength of the slab; and, b) provide an adequate amount of control and/or expansion joints to accommodate anticipated concrete shrinkage and expansion.

   In order to reduce the potential for unsightly cracks, slabs should be reinforced at mid-height with a minimum of No. 3 bars placed at 18 inches on center, in each direction. The exterior slabs should be scored or saw cut, ½ to ⅜ inches deep, often enough so that no section is greater than 10 feet by 10 feet. For sidewalks or narrow slabs, control joints should be provided at intervals of every 6 feet. The slabs should be separated from the foundations and sidewalks with expansion joint filler material.

5. No traffic should be allowed upon the newly poured concrete slabs until they have been properly cured to within 75 percent of design strength. Concrete compression strength should be a minimum of 2,500 psi.

6. Driveways, sidewalks, and patio slabs adjacent to the house should be separated from the house with thick expansion joint filler material. In areas directly adjacent to a continuous source of moisture (i.e., irrigation, planters, etc.), all joints should be additionally sealed with flexible mastic.

7. Planters and walls should not be tied to the house.

8. Overhang structures should be supported on the slabs, or structurally designed with continuous footings tied in at least two directions.

9. Any masonry landscape walls that are to be constructed throughout the property should be grouted and articulated in segments no more than 20 feet long. These segments should be keyed or doweled together.

10. Utilities should be enclosed within a closed utilidor (vault) or designed with flexible connections to accommodate differential settlement and expansive soil conditions.

11. Positive site drainage should be maintained at all times. Finish grade on the lots should provide a minimum of 1 to 2 percent fall to the street, as indicated herein. It should be kept in mind that drainage reversals could occur, including post-construction settlement, if relatively flat yard drainage gradients are not periodically maintained by the homeowner or homeowners association.

12. Air conditioning (A/C) units should be supported by slabs that are incorporated into the building foundation or constructed on a rigid slab with flexible couplings for plumbing and electrical lines. A/C waste water lines should be drained to a suitable non-erosive outlet.

13. Shrinkage cracks could become excessive if proper finishing and curing practices are not followed. Finishing and curing practices should be performed per the Portland Cement Association Guidelines. Mix design should incorporate rate of curing for climate and time of year, sulfate content of soils, corrosion potential of soils, and fertilizers used on site.

PRELIMINARY PAVEMENT DESIGN

Based on an assumed "R"-Value of 40 and developed traffic indices using the county method of calculating traffic indices, and the design guide for California Cities and Counties, the pavement sections tabulated below are calculated:

Location	Assumed Traffic Index	Subgrade "R"-Value	AC (Inches)	AB (inches)
Paver Area	6.0	40	13	____
Access Roads	6.0	40	4.0	6.0

All pavement installation, including preparation and compaction of subgrade, compaction of base material, and placement and rolling of asphaltic concrete should be done in accordance with the City of Lake Forest's applicable specifications and under the observation and testing of the project geotechnical engineer and/or the City of Lake Forest. Minimum compaction requirements should be 90 percent for subgrade and 95 percent for aggregate base as per ASTM D-1557 (modified proctor). The final design shall be based on "R"-Values tested during grading.

DEVELOPMENT CRITERIA

Slope Deformation

Compacted fill slopes designed using customary factors of safety for gross or surficial stability and constructed in general accordance with the design specifications should be expected to undergo some differential vertical heave or settlement in combination with differential lateral movement in the out-of-slope direction, after grading. This post-construction movement occurs in two forms: slope creep, and lateral fill extension (LFE). Slope creep is caused by alternate wetting and drying of the fill soils which results in slow downslope movement. This type of movement is expected to occur throughout the life of the slope, and is anticipated to potentially affect improvements or structures (i.e., separations and/or cracking), placed near the top-of-slope, up to a maximum distance of approximately 15 feet from the top-of-slope, depending on the slope height. This movement generally results in rotation and differential settlement of improvements located within the creep zone. LFE occurs due to deep wetting from irrigation and rainfall on slopes comprised of expansive materials. Although some movement should be expected, long-term movement from this source may be minimized, but not eliminated, by placing the fill throughout the slope region, wet of the fill's optimum moisture content.

It is generally not practical to attempt to eliminate the effects of either slope creep or LFE. Suitable mitigative measures to reduce the potential of lateral deformation typically include: setback of improvements from the slope faces (per the 1997 UBC and/or California Building Code), positive structural separations (i.e., joints) between improvements, and stiffening and deepening of foundations. Expansion joints in walls should be placed no greater than 20 feet on-center, in accordance with the structural

engineer's recommendations. All of these measures are recommended for design of structures and improvements. The ramifications of the above conditions, and recommendations for mitigation, should be provided to each homeowner and/or any homeowners association.

Slope Maintenance and Planting

Water has been shown to weaken the inherent strength of all earth materials. Slope stability is significantly reduced by overly wet conditions. Positive surface drainage away from slopes should be maintained and only the amount of irrigation necessary to sustain plant life should be provided for planted slopes. Over-watering should be avoided as it can adversely affect site improvements, and cause perched groundwater conditions. Graded slopes constructed utilizing onsite materials would be erosive. Eroded debris may be minimized and surficial slope stability enhanced by establishing and maintaining a suitable vegetation cover soon after construction. Compaction to the face of fill slopes would tend to minimize short-term erosion until vegetation is established. Plants selected for landscaping should be light-weight, deep rooted types that require little water and are capable of surviving the prevailing climate. Jute-type matting or other fibrous covers may aid in allowing the establishment of a sparse plant cover. Utilizing plants other than those recommended above will increase the potential for perched water, staining, mold, etc., to develop. A rodent control program to prevent burrowing should be implemented. Irrigation of natural (ungraded) slope areas is generally not recommended. These recommendations regarding plant type, irrigation practices, and rodent control should be provided to each homeowner. Over-steepening of slopes should be avoided during building construction activities and landscaping.

Drainage

Adequate lot surface drainage is a very important factor in reducing the likelihood of adverse performance of foundations, hardscape, and slopes. Surface drainage should be sufficient to prevent ponding of water anywhere on a lot, and especially near structures and tops of slopes. Lot surface drainage should be carefully taken into consideration during fine grading, landscaping, and building construction. Therefore, care should be taken that future landscaping or construction activities do not create adverse drainage conditions. Positive site drainage within lots and common areas should be provided and maintained at all times. Drainage should not flow uncontrolled down any descending slope. Water should be directed away from foundations and not allowed to pond and/or seep into the ground. In general, the area within 5 feet around a structure should slope away from the structure. We recommend that unpaved lawn and landscape areas have a minimum gradient of 1 percent sloping away from structures, and whenever possible, should be above adjacent paved areas. Consideration should be given to avoiding construction of planters adjacent to structures (buildings, pools, spas, etc.). Pad drainage should be directed toward the street or other approved area(s). Although not a geotechnical requirement, roof gutters, downspouts, or other appropriate means may be